INTERNATIONALISATION OF KOREAN INDUSTRY: A STUDY OF THE PERFORMANCE OF THE PLANT AND CONSTRUCTION INDUSTRY

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DECLARATION

No portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institution of learning.

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ABSTRACT

Since the mid-1970s, Korea has adopted an export-led economic policy based upon the development of her heavy chemical industry to make her export industry more competitive. The essence of this policy was to continue with steady export growth and to maintain its status as a Newly Industrialised Country (NIC). In this respect, it was thought that the pursuit of plant and construction exports could significantly contribute to a sustained export performance and the growth of the national product. The internationalisation of the plant and construction industry was assumed to have certain implications for Korea's export performance. This study attempts to investigate differences between Korean and non-Korean firms and between plant and construction firms in terms of: a) firm characteristics; b) success and failure among tenders; c) risk management; d) contract strategy; and e) international competitiveness.

The study has been undertaken by means of sociological and organisational analysis from an overall national level down to the firm level. A more deductive macro level approach has been pursued to diagnose the Korean export environment in terms of its international competitiveness and technological competence. While the investigation has involved general sociological, economic and technological considerations, more emphasis has been given a) to the failure of the industry to achieve a higher level orders for plant and construction exports and b) to an estimation of the international competitiveness of the industry and its ability to achieve a sustained export performance. The empirical work of the study was carried out at the country and industry level and

involved the choice of a sample of 62 firms (29 plant and 33 construction firms) in 12 countries. Resorting to data obtained through questionnaires, interviews and documentary sources, an inductive approach has been employed to examine the export performance of these firms and the implications for Korean firms.

The findings of the study indicate that, in general, Korean firms have been inferior to non-Korean firms in terms of technology, tender and contract strategy, risk management and competitive strategy. These disadvantages would have been lessened had government export and industrial policy and corporate strategy been accompanied by adequate policies in the field of: a) improving the technological level; b) enhancing productivity; c) adjusting industrial structure; d) cultivating small and medium-sized enterprises; e) making advances into overseas markets; and f) improving governmental support systems. The research has shown that successful tendering for plant and construction exports can best be explained by: i) cooperation with importing countries (i.e. joint-ventures and consortia membership); ii) the quality of bids (i.e. meeting delivery date, after-sales services, product quality and experience of the tender process); iii) relationships with importing countries (close political and cultural ties); iv) willingness to meet incidental conditions imposed by importing countries (e.g. demands for favourable and competitive credit terms and a commitment to high local procurement ratios); and v) price competitiveness.

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CHAPTER 1

INTRODUCTORY VIEW: SCOPE, OBJECTIVES AND STRUCTURE OF THE STUDY

1.1 INTRODUCTION

Supported by a strong export performance by light industry, the Korean economy demonstrated high economic growth until the mid-1970s, when exports of simple manufacturing goods peaked due to adverse changes in the international trade environment. Thus, it became essential for Korea to reorganise her industrial structure from light industry to heavy chemicals and to make her export industry more competitive. The basic goal of the Korean economy since the mid-1970s has been to continue with steady export growth and maintain its status as a Newly Industrialised Country (NIC).

The economy experienced sudden cost push factors in the mid-1970s arising from excessive public sector expenditure, foreign borrowing and an increase in international raw material prices. In addition, Korean exports were faced with growing protectionism in world markets. Under these circumstances, the pursuit of plant and construction exports, a sector in which Korea enjoys a comparative advantage and a reputation for economic co-operation with less developing countries, was regarded as the principal means of generating a sustained export performance.

Korean overseas construction projects seemed particularly capable of contributing to the growth of the national product by guaranteeing a plentiful supply of skilled and semi-skilled labour to overseas construction sites.

Consequently, the Korean government actively promoted industrial plant exports in 1978 by amending the tax system in the industry's favour. In response, industrial plant exports by value increased dramatically from US 204 million dollars in 1979 to US 1,388 million dollars in 1985, an average annual growth rate of 40.8 %. The ratio of industrial plant exports to a) total exports and b) machinery exports (including ships and electronic equipment), was 1.4 % and 4.9 % in 1979, respectively. However, the former had increased to 4.6 % and the latter to 10.0 % by 1985. This trend suggests that industrial plant exports have the potential to out-perform major Korean industries, such as heavy chemicals and metal and machinery in overseas markets.

Korea won its first construction contract abroad in 1965 (assisted by favourable taxes and financial support). The value of such exports increased gradually to 1977, reaching US 3.5 billion dollars. Some 90.0 % of these initial construction contracts came from the Near and Middle-East. In 1981 the same proportion still came from the Near and Middle-East and contributed US 3 billion dollars to the country's GNP (including the value of sub-contracts to domestic companies). By 1981 export value had increased steeply to US 14.3 billion dollars.

However, industrial plant exports decreased markedly in 1987 to US 487 million dollars (from US$ 1,388 million in 1985 and US$ 627 million in 1986), a decline of approximately 54.8 % in 1986 and 22.7 % in 1987 compared with the previous year. Overseas construction exports decreased marginally in 1982 to US 13.8 billion dollars (from US$ 14.3 billion in 1981), but then decreased steeply to US$ 10.4 billion in 1983, US$ 6.6 billion in 1984, US$ 4.8 billion in 1985, US$ 2.6 billion in 1986 and marginally to US$ 2.1 billion in 1987. This decline can be attributed to sluggish Middle-East activity affected by falling oil revenues and tougher competition in the international construction market.

1.2 SCOPE AND OBJECTIVES OF THE STUDY

The Korean economy is heavily dependent on exports, particularly machinery, plant and construction exports. However, in international markets these products and services are uncompetitive relative to US, West Germany, Japan and U.K. competitors.

Despite the plethora of research, both theoretical and empirical, into the international dimensions of industries and markets, little work has been conducted into the structure, growth and performance of firms involved in international Third World projects in the construction and plant industry. Within this context, estimates of the competitiveness of the major suppliers have been neglected. In Korea, for example, very little evidence has been presented to allow a study and evaluation of the performance and competitiveness of Korean firms. Most Korean studies to date have emphasised export performance by value rather than by a more objective measure of competitiveness. Therefore, a primary purpose of the study is to suggest strategic options for improving the export performance of the plant and construction industry in Korea. A further aim of this study is to identify the reasons for such uncompetitiveness and to indicate suitable strategies to improve the international competitiveness of the Korean plant manufacturing and construction industry.

In dealing with the reasons for uncompetitiveness, attention will be given a) to the failure of the industry to achieve sufficient orders for plant and construction exports and b) to an estimation of the international competitiveness of the industry.

Other aspects also covered in this study are as follows:

1. The theories and applications of "internationalisation".
2. The nature and characteristics of the export base of the plant and construction industry.
3. The concept of risk management and contract strategy in the plant and construction projects.
4. The current market(s) for plant and overseas construction exports among developed countries.
5. The status of plant and overseas construction exports from Korea, including the present condition of the Korean Economy and problems associated with the sustained growth of plant and overseas construction exports from Korea.
6. Case histories of four contracts by Korean firms.
7. An empirical survey of risk management and contract strategy in plant and construction contracts.

The overall objective of this study is to explore the feasibility of a sustained export performance in the plant and overseas construction industry by an analysis of its international competitiveness and technological competence. The potential for expansion in the industry will be explored and policy recommendations will be put forward.

It is hoped that the findings of this study can be generalised to explain the relationship between the technological level achieved by the Korean industry and its international competitiveness relative to competing developing countries that share many social, economic, political and cultural features with Korea. It is expected that this study will serve as a guideline for MNCs which are interested in exporting to developing countries, especially in the plant and overseas construction industry. Finally this research is expected, through its arguments, assumptions, empirical investigation and findings, to throw light on the role of MNCs in the international plant and construction industry from the Third World's point of view.

1.3 STRUCTURE OF THE STUDY

The study has been structured into eleven chapters including: a) the theoretical framework of the study; b) the Korean context (the contemporary economic condition, the status of plant and construction exports and case histories of four contracts); c) the empirical investigation; and d) research methodology and conclusions. The outline of the study is as follows:

Chapter 2 presents a literature survey of theories of the internationalisation process and their empirical evidence. Five relevant themes covered in this chapter are: a) comparative advantage theories; b) the product life cycle theory; c) the internationalisation process theory; d) the internalisation theory; and e) the eclectic theory of international production. Theoretical perspectives borrowed from the literature helped to formulate an understanding of the internationalisation of the Korean plant and construction industry.

Chapter 3 deals with research methodology and gives a detailed account of research design and methods, data collection, choice and characteristics of the research sample, the hypothesis of the study and statistical techniques used for data analysis.

Chapter 4 outlines the characteristics and nature of the plant and construction industry. The first section of this chapter presents the general concepts, definitions, classification and characteristics of plant exports. The second section deals in similar fashion with the construction industry.

Chapter 5 introduces the concept of risk management and contract strategy in plant and construction projects. The first section of this chapter discusses the concept of risk management in terms of the three stages of risk management, namely, identification of risk, and the analysis of and response (including the application) to risk management. The second section presents the concept of contract strategy and mainly focusses on: a) project characteristics; b) organisational structures for design and construction; c) types of contract; and d) the tendering process.

Chapter 6 provides extensive statistical data with regard to contemporary plant and overseas' construction exports from developed countries. The data in this chapter are mainly concerned with: a) the trend of general plant exports in OECD countries since 1982; b) export value by major countries in OECD in 1986; and c) the trend of construction exports by major exporting countries and region since 1982. By analysing these data, this chapter attempts to understand the major features of the plant and overseas' construction exports from developed countries.

Chapter 7 examines the Korean context associated with: a) the contemporary Korean economy; b) the status of plant exports and imports; c) contemporary overseas' construction exports; and d) problems associated with plant and construction exports from Korea. In addition, this chapter presents an international comparison of general plant and overseas' construction exports and a structural analysis of the Middle-East construction market, which shares over 69.0 % of total overseas' construction exports from Korea.

Chapter 8 The major concern of this chapter is to analyse the factors influencing, respectively, success and failure among tenders for plant and construction exports. Section one of this chapter presents and discusses the findings of a survey with respect to a) a comparison of firm size, market share, firms' objectives and major export regions between Korea and developed countries and b) a comparison between plant and construction firms. Section two interprets the findings regarding the determinants of successful/failed tenders for plant and construction exports; section three does the same for Korean construction exports. The final section introduces regression models to explain export success and failure in the plant and construction industry.

Chapter 9 introduces the case histories of four contracts by Korean firms, of which two relate to plant exports and two to construction exports. The purpose of this chapter is to identify factors which might be considered as pre-conditions of success or failure and, in so doing, contribute to an understanding of how major projects can be accomplished successfully.

Chapter 10 presents an empirical survey of risk management and contract strategy in plant and construction contracts. The first section of this chapter presents and examines the attitudinal differences a) between country groups (Korea and other countries) and b) between industry groups (plant and construction) towards the stages of risk management, namely, the identification of sources of risk, analysis and response. The second section is concerned with analysing the attitudinal differences between the country and the industry groups with respect to: a) organisational structures for design and construction; b) types of contract; c) the tendering process; and d) the incidental conditions of contract imposed by importing countries. The final section investigates the relationship between the variables associated with risk management and contract strategy.

Chapter 11 The major concern of this chapter is to estimate the international competitive power of Korean firms compared with non-Korean firms in the plant and construction industry. This chapter briefly introduces the concept of international competitiveness and estimates the competitive power of Korean plant and construction exports. A comparison of the international competitive power of plant exports was carried out by an analysis of "revealed" comparative advantage. More specifically, this chapter presents and discusses the topics associated with technology transfer, namely: a) definitions and concepts; b) channels for technology transfer; c) international trends; d) the current situation in Korea; and e) problems associated with technology transfer in Korea. In addition, Chapter 11 presents and discusses the attitudinal differences between the country and the industry groups with regard to the education system, technology and competitive advantage.

Chapter 12 presents the strategic options available to improve the export performance of the Korean plant and construction industry. This chapter concludes with policy recommendations based on the hypotheses, arguments, evidence and findings reported in the preceding chapters.

CHAPTER 2

LITERATURE REVIEW

The present chapter deals with a literature survey of theories of the internationalisation process and their empirical evidence. The internationalisation process, or the process by which firms enter into and subsequently step up their international business activities, has recently received significant research attention. A complete theory of the international process is required to explain the choice of options available to the firm in servicing a market. To date there is no unique and comprehensive theory, but a handful of theories exist, some with common features, and each with their own special strengths, weakness and limitations.

It is intended, through the literature survey, to understand the internationalisation of the Korean plant and construction industry. This chapter is divided into the following:

2.1 Theories of the internationalisation process;

2.2 The internationalisation process: key variables.

2.1 THEORIES OF THE INTERNATIONALISATION PROCESS

This section reviews the theories of the internationalisation process which can be divided into five groups: 1) comparative advantage theories; 2) the product life cycle theory; 3) the internationalisation process theory; 4) the internalisation theory; and 5) the eclectic theory of international production.

2.1.1 Comparative Advantage Theories

David Ricardo, a supporter of free trade in the early 19th century, proposed in his law of comparative advantage that every country has a comparative advantage in something and gains from trading it for other things even though there may be no absolute advantage. In his model of comparative advantage it is assumed that factors of production are fully mobile within a nation but immobile between countries. This assumption carries over to the Heckscher-Ohlin model and most other theories of trade. Ricardo's doctrine was applicable to a static model and was based on the labour theory of value. However, in the real world, dynamic, not stationary, conditions exist and change prevails, static conditions being the exception. Factors of production are mobile internationally, and technological leadership waxes and wanes in deference to the underlying assumptions in the classical free trade model.

These fluctuations and shifts in the relative strength of factor endowments have been explained by the Heckscher-Ohlin theory and some of the more recent international trade theories. In the simple Heckscher-

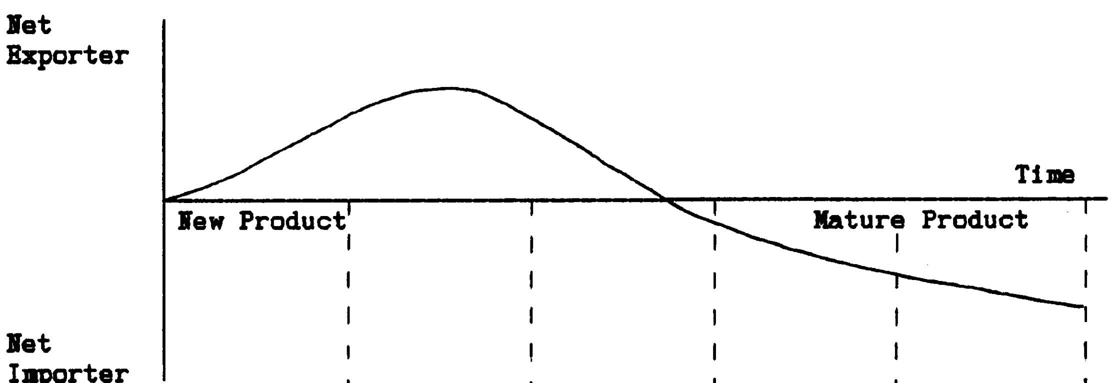
Ohlin theory with two factors, two goods and two nations, a sufficient reasons for price differentials between countries is the existence of non-equal supplies of factor endowments within nations. In fact, this difference in factor endowment (where factors can be classified into broad groupings such as labour, land, resources, capital and technology) is the only relationship required to generate trade. Thus, nations can have identical production functions, identical tastes and be identical in every other respect, but there will still be available a welfare gain from trade compared to autarky. The Heckscher-Ohlin model assumes perfect goods and factor markets and essentially sets all other conditions equal to zero. This means that items such as tariffs, quotas, taxes, and transport costs are all ignored. Thus, none of these items can affect the ratio of foreign to domestic prices and thereby determine trade patterns.

Location theory suggests that the spatial allocation of plants and subsidiaries is determined by costs of factor inputs in various regions, together with the transport costs involved in linking the production process with the firm's marketing strategy.

2.1.2 Product Life Cycle Theory

Recently the international product life cycle theory (IPLC theory hereafter) has introduced a more dynamic theoretical explanation of the internationalisation process. The central point of this model, developed by Vernon (1966), is the role of new product characteristics in affecting the decision of the innovating firm to invest abroad. Vernon's first statements of IPLC theory were motivated by a desire to explain the international trading patterns of the United States. He observed that the US was a fertile source of innovation, due to a combination of high income levels and a corresponding demand for a wide variety of sophisticated goods and the relative scarcity of labour vis à vis capital, leading to the search for labour-saving technologies. Very important, of course, was the size of the home market. Vernon attempted to describe a cycle of international trade based upon product development over time and space. This cycle has been portrayed in Figure 2.1.

Figure 2.1: A Schematic Presentation of the US Trade Position in the Product Life Cycle



Phase I	Phase II	Phase III	Phase IV	Phase V
All production in US US exports to many countries	Production started in Europe US exports mostly to LDCs	Europe exports to LDCs US exports to LDCs displaced	Europe exports to US	LDCs export to US

Source: Thomas, M.J., (1981), European Journal of Marketing 15, 3, p.42.

In the first phase, the innovating firm introduces new products to meet demand in its local market. As the product matures the original innovator's specific advantage is shared with others at home and abroad: the threat of price competition becomes tangible and exports will start to play an important role. Also, importing countries may begin to consider ways of encouraging local production by means of import restrictions. These considerations will induce innovators to move production to foreign locations.

2.1.3 The Internationalisation Process Theory

This theory describes a process in which firms gradually and sequentially increase their international involvement.

In a pioneering study, Simmonds and Smith (1968) approached the initiation of exporting in the context of innovation. "Entry into an export market is just as much an innovation as the adoption of a new production process, for example, so there is every reason to suspect that many of the findings concerning other types of innovation will apply to it".

Johanson and Wiedersheim-Paul (1975) noted in their observations of Swedish firms that the prevailing pattern is a gradual internationalisation, rather than large spectacular investments.

They proposed four different internationalisation stages. They are: no regular export activities in Stage One; export via independent representatives (agent) in Stage Two; via sales subsidiaries in Stage Three; production/manufacturing in Stage Four. They regard these stages as significant because they differ with regard to the degree of involvement of the firm in the market.

Johanson and Vahlne (1977) reinforce the belief that the internationalisation process represents firms' "gradual acquisition, integration, and use of knowledge about foreign markets and operations, and on its successively increasing commitment to foreign markets". Absence of prior experience, lack of adequate market information and associated uncertainty in foreign marketing are the causes of the incremental decision making. Market uncertainty concerned with a commitment can be "reduced through increases in interaction and integration with the market environment-steps such as increases in communication with customers, establishment of new service activities or, in the extreme case, the takeover of customers".

Bilkey and Tesar (1977) proposed a "stages" model for examining export behaviour. The main thrust of their argument is that the export development process of firms occurs in stages. Management is not interested in exporting in stage one; would fill an unsolicited export order in stage two; actively explore the feasibility of exporting in stage three. The firm exports on an experimental basis to some psychically close country in stage four; is an experienced exporter to that country and adjusts exports optimally to changing exchange rates, tariffs, etc. in stage five. In the final stage, stage six, management explores the feasibility of exporting to additional countries that, psychically, are further away. They related each stage empirically to a number of determining characteristics, concluding with considerations that influence firms' progression from one stage to the next.

Bilkey (1978) also proposed similar export stages, which are derived from Roger's stages theory of the adoption process (Rogers, 1962, pp. 81-86). In stage one the firm is unwilling to export and would not even fill an unsolicited export order because of apathy or dislike of foreign activities, busy doing other things, etc; fills unsolicited export orders, but does not explore the feasibility of exporting in stage two; explores the feasibility of exporting (which may be omitted by the receipt of unsolicited export orders) in stage three; exports experimentally to one or a few markets in stage four; is an experienced exporter to those markets in stage five; explores possibilities of exporting to additional markets in stage six.

Independent investigations at the US Department of Commerce (1978) also confirm a gradual involvement hypothesis. In particular, firms are thought to progress through an 'exporting pipeline'. Thus, the firm becomes motivated to export, then decides how and where to export, devotes manpower and resources to marketing efforts, and so on.

Wiedersheim-Paul, Olson and Welch (1978) developed a model that stresses the importance of a firm's activities and "pre-export" behaviour for the export start. Factors such as information, characteristics of the decision-maker, the enterprise environment, and the extra-regional expansion of the firm were of special importance in the model.

Many firms appear to 'move ahead' with exporting without much rational analysis or deliberate planning. In an investigation of Nebraska-based small manufacturing firms, Lee and Brasch (1978) found that most new exporters followed a 'non-rational decision process'. They did not consult with expert authorities or collect much information, and they had only vague justifications for getting themselves involved in exporting. The authors attribute this result to the difficulty firms have of calculating the economic benefits of exporting, the naive acceptance of the assertions that "the market is out there" and the lack of sophisticated information, planning and control systems in small companies. Lee and Brasch also examined whether the export adoption process would be initiated by problem perception or by awareness of the innovation. They concluded that an innovation-oriented adoption process was more common among export adopting firms than problem-oriented adoption process. That is, the initiating force is either precise knowledge of the existence of a market opportunity or gaining technical knowledge of exporting, rather than a response to problems which the firm may be facing.

In studying Australian firms, Welch and Wiedersheim-Paul (1979) also stressed the sequential nature of the export development process. They characterised it as "a multi-state set of activities, with a high degree of diversity". Firms typically avoided making large commitments to international markets, and resource allocation proceeded in an incremental manner.

Rugman (1980) argued that internationalisation is the process of going abroad at a slow and cautious pace and the process of internationalisation, a typical penetration of foreign markets, follows these stages: 1) licensing; 2) exporting; 3) establishment of local warehouses and direct local sales; 4) local assembly and packaging; 5) formation of a joint venture; 6) foreign direct investment (that is, full scale local production and marketing by a wholly owned subsidiary).

The typical pattern is thought to be the consequence of greater uncertainty, higher costs of information and the lack of experimential knowledge in foreign marketing activities. Several distinct stages are identified along the internationalisation process: domestic marketing; a pre-export stage; experimental involvement; active involvement; and committed involvement (Cavusgil, 1980).

A conceptualisation of the internationalisation process and various stages along the process are illustrated in Figure 2.2 (Cavusgil, 1981).

FIGURE 2.2

Characterisation of the Stages in the Internationalisation Process

	STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5
STAGES IN THE INTERNATIONALISATION PROCESS	PRE-INVOLVEMENT STAGE	REACTIVE INVOLVEMENT (Response to unsolicited opportunities)	LIMITED EXPERIMENTAL INVOLVEMENT	ACTIVE INVOLVEMENT	COMMITTED INVOLVEMENT (Full-fledged and perpetual)
AWARENESS OF OPPORTUNITIES	Low	Sporadic	Moderate	High	Intense
NATURE OF SEARCH PROCESSES	Limited	and	selective	Intensive venture search	
DOMINANT DECISION-MAKING MODE	Disjointed	and	incremental	Formal and structured	
TYPICAL DECISION-MAKING SKILLS UTILIZED	Passive	Reactive	Intuitive and Problem-solving oriented	Proactive & Entrepreneurial	Highly systematic & informed

Source: Adapted from Cavusgil, 1980

The basis for distinguishing among the firms in various stages includes: management's level of awareness of foreign market opportunities, the nature of search processes for information, the decision-making mode of management, typical decision-making skills utilised, and the nature of international marketing involvement.

The five stages identified should be considered as tentative characterisations. The essential proposition, however, is that firms do differ in terms of the manner in which they exploit export marketing opportunities. The extent and the nature of involvement in export marketing will vary from one firm to another. This is because the opportunities encountered by the firm, and the way in which the management respond to those opportunities, are different among firms. In making operational internationalisation framework, two stages were created for exporting firms and two for non-exporting firms by Cavusgil (1981). Interest in collecting export-related information served to distinguish the two types of non-exporters, and the level of export activity was used as the basis for differentiating the two types of exporters. His four operational internationalisation stages identified were defined in the following way:

Stage One: Non-exporting firms. Not interested in gathering export-related information.

Stage Two: Non-exporting firms. Interested in gathering export-related information. (These correspond roughly to "Pre-involvement stage" in the conceptualisation.)

Stage Three: Exporting firms. Export less than 10 percent of their output. (Correspond to "limited, experimental involvement stage" in the conceptualisation.)

Stage Four: Exporting firms. Export more than 10 percent of their output. (Correspond to "active involvement stage" in the conceptualisation.)

While these operational definitions are not totally satisfactory, they do provide a way of classifying firms into one of the stages and subsequently searching for meaningful distinctions among them.

Cavusgil (1981) made the following observation on the internationalisation process of firms: Marketing of goods and services beyond the home market is a distinct alternative for the firm as a means of accomplishing the organisational goals of growth, profits and market diversification. Admittedly, this avenue is not open to all firms. Some necessary conditions, such as the possession of a unique or competitively priced product, have to be satisfied before a firm can profitably exploit this alternative. Furthermore, risks and uncertainty encountered in international marketing are greater. However, more and more firms are looking into the possibility of utilising this growth alternative in order to take advantage of attractive marketing opportunities abroad and to relieve themselves from the consequences of unfavourable developments at home, including growing competitive pressures. The internationalisation process does not appear to be a sequence of deliberate, planned steps, beginning with a clearly defined problems and proceeding through a rational analysis of behavioural alternatives.

2.1.4 Internalisation Theory

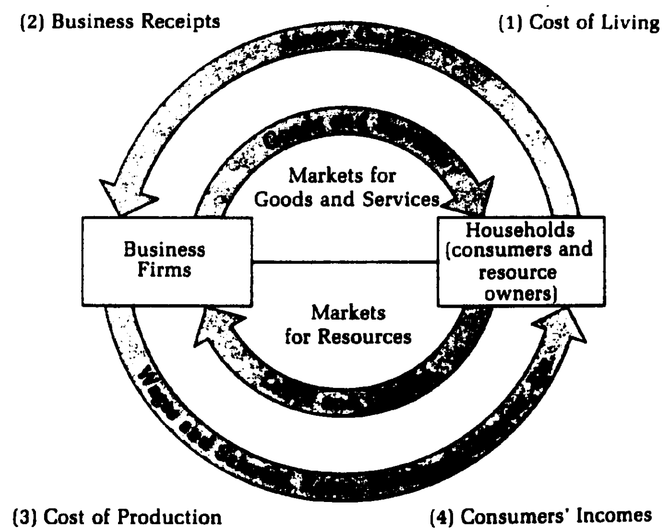
As opposed to the "business policy" approach of the internationalisation theories, the internalisation theories have their roots in traditional industrial economies, but with a neglected element, namely the concept of internal markets.

Before "internalisation theory" can have meaning, the term, internal markets, must be understood. Leftwich and Eckert (1982) attempted to discribe the concept of markets based upon a process of two-fold character: markets for goods and services and markets for resources. This concept of markets is indicated in Figure 2.3.

The widely used "circular flow" diagram of Figure 2.3 furnishes a highly simplified model of a private enterprise economic system. Leaving the government aside for the present, economic units are classified into two groups: (1) households and (2) business firms.

The upper half of Figure 2.3 represents the markets for consumer goods and services. Households, as consumers, and business firms, as sellers, interact within the markets. Goods and services flow from business firms to consumers; a reverse flow of money from consumers to business firms also takes place.

Figure 2.3: <u>The circular flow model</u>



The lower half of Figure 2.3 indicates the markets for resources. The services of labour and capital in their many forms flow from resource owners (households) to business firms. The reverse flow of money in payment for these resources occurs in such forms as wages, salaries, rents, dividends, interest, and so on, depending on the contractual arrangements under which they are delivered.

Money circulates continuously from households to business firms and back to households again. The money flow takes on four familiar aspects as it makes a complete circuit. It is consumers' costs of living at point (1) in Figure 2.3 as it leaves consumers' hands. It is business receipts for business firms at point (2). At point (3) the money flow becomes costs of production; while at point (4) it is consumers' incomes.

Selling markets are usually classified into four types based on (1) the importance of individual firms in relation to the entire market in which they sell and (2) whether or not the products sold in a particular market are homogeneous. The market types are (1) pure competition, (2) pure monopoly, (3) oligopoly, and (4) monopolistic competition.

In pure competition there are many firms selling the identical product with no one of them large enough relative to the entire market to influence the market price. If one firm drops out of the market, supply is not decreased enough to cause the price to increase perceptibly.

A market situation in which a single firm sells a product for which there are no good substitutes is called pure monopoly. The firm has the market for the product all to itself. There are no similar products whose price of sales will perceptibly influence the monopolist's price of sales, and vice versa.

An oligopolistic industry is one in which the number of sellers is small enough for the activities of a single seller to affect other firms and for the activities of other firms to affect that firm in turn. Changes in the output and the price charged by one firm will affect the amounts that other sellers can sell and the prices that they can charge.

Monopolistic competition is a market situation in which there are many sellers of a particular product, but the product of each seller is some way differentiated, in the minds of consumers, from the product of every other seller. As in pure competition, there are enough sellers and each is small enough relative to the entire market so the activities of one have no effect on the others. Relationships among firms are impersonal. Product differentiation may take the form of brand names, trademarks, quality difference, or differences in conveniences or services offered to consumers.

According to Rugman (1980) a firm considers explicitly the relative costs of servicing foreign markets in one of three possible ways. First, the firm may simply wish to export to foreign markets. Second, the firm may engage in foreign direct investment, that is, set up an overseas subsidiary to produce for a local market. Third, a firm may wish to license to a possible host country producer. The method of servicing a foreign market may change over time, as the various costs associated with each of these three strategies change.

Under internalisation, it is necessary to consider explicitly the additional costs of servicing a foreign market by exporting, the additional costs of servicing a foreign market by foreign direct investment, and the possible costs associated with dissipation of the firm's knowledge advantage once licensing is considered as the third option. These relative costs can be better understood by a study of the new theory of internalisation, which emphasises not so much the process of developing international activities as the ability of firms to operate overseas within the framework of: 1) exporting; 2) foreign direct investment; 3) licensing.

It has been demonstrated by Buckley and Casson (1976), Dunning (1979), Hood and Young (1979) and Rugman (1980) that the activities of MNEs are explained by the theory of internalisation. It is a general theory of foreign direct investment and it can be used to help explain the methods by which MNEs choose to service foreign markets, namely the choice over time between exporting, foreign direct investment or licensing. Rugman (1981) tested the theory of internalisation in a Canadian case study, in the specific context of technology transfer to Canada by US MNEs. The process of internalisation implies that little innovation or worthwhile R and D is undertaken in Canada by foreign-owned firms since the initial knowledge advantage is generated by the parent (US) firm and exploited abroad in subsidiaries that are miniature replicas of the parent MNE.

Rugman (1981) found that the activities of the MNE are better explained by the theory of internalisation rather than by that of internationalisation. The modern theory of FDI places emphasis upon the firm-specific advantages enjoyed by the MNE, and it implies that such advantages are best exploited via foreign production, that is, by the process of internalisation. So the theory of FDI is really a theory of the MNE. The firm-specific advantages of the MNE are best explained by the newer concept of internalisation. It is a better explanation of how to service foreign markets than is the older theory of internationalisation, which ignored the special problem of licensing and the risk of knowledge dissipation.

2.1.5 The Eclectic Theory of International Production

Dunning (1981) tried to incorporate the whole aspects of FDI by integrating industrial organisation into the theories of foreign trade, taking into account the considerations of locational aspects in host countries in what he calls the "eclectic theory". Industrial organisation theory, as formulated by Hymer (1960), suggested that for enterprises of one nationality to be involved directly in an industry in another country, they must acquire or possess assets not available to indigenous firms, or firms of other nationalities, sufficient to overcome the disadvantages the enterprise will face in operating in a new and foreign environment. The eclectic theory of international production advanced by Dunning (1981) suggests that enterprises with headquarters in one country will have some form of involvement outside their national boundaries whenever they have competitive or ownership advantages over firms of other nationalities, and that they will find it economic to combine these assets with factor endowments located in foreign countries. The choice of whether an ownership advantage is exploited by the firm possessing it or leased to indigenous firms in the foreign country determines the form of international involvement. Having classified the theories of FDI into two main groups: the theory of international trade and the theory of industrial organisation, Dunning tries to integrate both theories into a systematic framework (an eclectic approach).

The core of Dunning's eclectic theory is that international production (foreign investment) would take place on the base of some specific advantages. On the one hand, MNCs would have ownership specific advantages (technology, marketing and management skills, R & D, market penetration, access to inputs and government incentives) which require the best available use: the greater the desire and ability to internalise such specific ownership advantages, the more is the expectation to invest abroad. On the other hand, the locational aspects (prices of primary factors, transport and communication cost, control on imports, taxation, infrastructure and political stability) play an important role in taking a decision whether to locate production abroad or to export or to licence.

The eclectic theory suggests that MNCs which have the strength to internalise their activities and which face export barriers and strong competition in foreign markets will have more international involvement.

In such cases, foreign production will be preferred to protect or create foreign markets and exploit the specific ownership advantages in the best ways. To support his eclectic theory, Dunning (1980) conducted an empirical investigation. He concluded that the growth of modern MNCs may be explained in terms of ownership specific advantages, especially in technology-intensive industries.

2.2 THE INTERNATIONALISATION PROCESS: KEY VARIABLES

An analysis of the significance of different variables in the internationalisation process of the firm can be divided into four groups: 1) international trade theory; 2) internationalisation process theory; 3) internalisation theory; and 4) the eclectic theory of international production.

2.2.1 International Trade Theory

The fluctuations and shifts in the relative strength of factor endowments have been explained by the Heckscher-Ohlin theory and some of the more recent international trade theories. One of these theories was presented by Raymond Vernon (1966) as a product life cycle theory. The approach taken by Vernon was to advocate less emphasis on a doctrine of comparative costs and greater reliance on the timing of innovations, the effects of scale economies and the roles of ignorance and uncertainty in influencing trade patterns.

Hoy and Shaw (1981) examined this updated, dynamic conception of the law of comparative advantage, together with the product life cycle theory for the United States (where manufactured goods had already moved through the stages of the product life cycle as suggested by Vernon, from the stages of new product, through maturing product, to standardised product). This progression is based on the international product life cycle which shows that as production and exports expand into the product maturity stage, and as the technologies gained by other advanced countries begin to cause a decline in demand, US exports will drop off and the excess production from these countries will tend to stimulate demand and lower prices. In the mature stage they become standardised products which are then imported to the United States, completing the cycle to the obvious detriment of the US.

If the United States is to maintain a surplus trade balance, it must encourage a continuous flow of technological innovations. Most European countries and Japan have been expanding research and development expenditures relative to gross national product for the past 15 years, while this percentage in the United States has declined. Foreign licensing of technology to the United States during the last five years has expanded much more quickly than United States licensing abroad.

As examples of this technology loss we can readily cite automobiles, steel making, ship building, office machines, copiers, calculators, data processing hardware, electronics, and recent computer technology, in particular. As an example, the television industry, which was pioneered and developed in the United States, has now been almost completely absorbed by Japanese manufacturers.

Another obvious example is the automotive industry, where the US pioneered and developed an improved technology and has now lost a substantial share of the world market as a result of extensive expenditures for the development of more economical engines by the Japanese, West Germans, French and Italians. As a result of their concentration on the development of new technology, the Japanese have developed more efficient emission systems than American technology has been able to emulate.

Technical advantage and construction capacity in the ship-building industry has also been abdicated by the United States. Many of the capital goods markets have followed a similar pattern.

This decline in R & D investment has resulted in a substantial deterioration of trade performance in most manufactured goods, which has continued unabated despite the expected benefits which were predicted to accrue as a result of the trend devaluations of the dollar.

This fact, considered along with Vernon's international product life cycle theory, supports his hypothesis that United States exports high technology, high income and labour saving products in the early stages, and these products, improved upon and further developed by other countries, are then imported back to the American consumer.

However, innovation in the process of production will improve production in the United States and increase the length of the product life cycle by improving the competitive position of the United States. Therefore, the successful international firm must innovate its product offerings, find new customers and markets, particularly among the developing countries, and in this manner super-impose a new cycle on the old one.

The firm may use a strategy of image building or brand loyalty as non-price forms of competition to extend a product's life cycle. Indeed, the entire international marketing strategy may be based on developing several approaches to extending the product life cycle and discouraging other nations from entering the world market.

2.2.2 Internationalisation Process Theory

Simmonds and Smith (1968) approached the initiation of exporting in the context of innovation. They investigated nine small British manufacturing units with autonomy as far as the marketing, function was concerned, although four were wholly owned subsidiaries of larger firms.

The initial hypothesis that the innovation would be largely generated within the firm was not supported by the investigation. For six of the nine firms the first export order was generated from outside the firm. In two cases the order was initiated by a customer.

The expectation that the innovator would have travelled widely was clearly supported. The evidence suggests that promotion of internationalism may be more effective in stimulating new exports than a strategy of appealing to nationalistic motives.

None of the three innovating entrepreneurs had been active in exporting previously. Thus, there was little support for the expectation that the innovators would have transferred experience of exporting from other situations.

The second class of characteristic they expected to find amongst innovating exporters was 'enterprise' - implying a high degree of risk tolerance, aggresive drive and profit motivation. This expectation was well supported by the cases. The same data also supported the expectation that there would be a prior history of innovation in other aspects of management.

There was surprisingly little support for the expectation that the entry into exporting would stem from a marketing orientation. The opposite was more the case. The important ingredient for innovation seemed to be sales drive, not marketing awareness. This observation may, however, reflect the economics of the situation. Profits may be higher at first from stressing sales effort with attention to broader marketing considerations, posponed until the more easily reached potential has been tapped. A marketing outlook, then, would be more important at a later stage than at the point of innovation in exporting.

No evidence was found in any of the nine firms that national interest provided a motive for exporting, and in the majority of cases the initiator of the first order was 'supranationalist', at least to the extent that his background covered more than one nation. The study also underlined the importance of "change agents" in initiating the innovation.

Johanson and Wiedersheim-Paul (1975) and Johanson and Vahlne (1977) investigated the internationalisation of four Swedish engineering firms. Their basic assumption was that the firm first develops in the domestic market and that internationalisation is the consequence of a series of incremental decision. They also assumed that the most important obstacles to internationalisation are lack of knowledge and resources.

The process, i.e. no regular export, independent overseas representative (an agent), sales subsidiary, manufacturing-offers a plausible description of the order of the development of operations of the firms in individual countries. This is illustrated in Table 2.1. Of sixty-three sales subsidiaries, fifty-six were preceded by agents, and this pattern is the same for all the firms.

TABLE 2.1

ESTABLISHMENT PATTERNS FOR THE INVESTIGATED FIRMS(1)

Pattern	Sales subsidiary			Production subsidiary	
Firm	n ↓ s	a ↓ s	n ↓ p	a ↓ p	s ↓ p
Sandvik	2	18	0	2	13
Atlas Copco	3	14	0	3	9
Facit	0	14	0	2	3
Volvo	2	10	0	2	3
	7	56	0	9	28

"n" denotes no regular export activity
"a" denotes selling via agent
"s" denotes sales subsidiary
"p" denotes production subsidiary
an arrow denotes change from one state to another

(1) Source: Johanson and Viedersheim-Paul (1975), p. 322.

With regard to overseas' production establishments, there is a difference between Sandvik and Atlas Copco on the one hand, where twenty-two out of twenty-seven establishments were preceded by sales subsidiaries, and Facit and Volvo on the other, where four out of ten occurred without the firm first setting up a sales subsidiary. However, in no case did a firm start production in a country without first having sold in the country via an agency or sales subsidiary.

Regarding the first establishment of sales subsidiaries, there did not appear to be a conscious, directed internationalisation policy - at least not in Sandvik, Atlas Copco, and Volvo. For various reasons they took over representatives (agencies) or started sales subsidiaries. As they gradually gained experience in starting up and managing subsidiaries, they developed policies of marketing through subsidiaries in some of the firms.

Bilkey and Tesar (1977) investigated the export behavior of 423 small and medium-sized Wisconsin manufacturing firms. Their data were classified according to stages in the export development process and analysed by multiple regression. The model they used was explained in the previous section. The dependent variable was whether management had explored the feasibility of exporting.

No meaningful correlations were found with managements' profit nor other expectations regarding the effect of exporting on their firm. They found that exporting by smaller-sized US manufacturing firms correlates with whether or not an official of the firm had studied a foreign language while in school, and whether that experience abroad was attractive. In other words, Stage Three (management actively explores the feasibility of exporting) of the export development process seems to be much more nearly a function of managements' general images of exporting and of foreign lands than of immediate economic considerations. The overwhelmingly most important single determinant of whether or not those firms entered Export Stage Four - exported experimentally - was the receipt or non-receipt of an unsolicited initial export order. The next most important determinant was the quality and dynamism of the firms' management. Analysis showed that compared with firms whose initial export orders were unsolicited (Stage Two), the firms that obtain their own initial export order: 1) were much larger (almost two-and-a-half times as many employees); 2) had much more favourable expectations regarding the advantages of exporting for their firm; 3) had much better and more dynamic managements; and 4) perceived somewhat fewer barriers to exporting.

Perceived barriers to exporting were found to be meaningful only for firms in Export Stage Five (experienced exports). It was noted, however, that the composition of certain of the perceived barriers tended to differ systematically by export stage. The following varied directly with export stage; that is, the further advanced the export stage, the greater the proportion of firms that perceived these considerations as a barrier to exporting:

- Difficulty in understanding foreign business practices.
- Different product standards and consumer standards in foreign countries which make US products unsuitable for export.
- Difficulty in collecting money from foreign markets.
- Difficulty in obtaining adequate representation in foreign markets.

In addition, one perceived barrier found to differ inversely with export stage was difficulty in obtaining funds necessary to get started in exporting.

Bilkey (1978) also reviewed the export behaviour of the 423 Wisconsin manufacturing firms according to Roger's stages of the adoption process (Rogers, 1962, pp. 81-86).

The results differed greatly. Movement from stage one and two to stage three was only partly explained (R^2 = 0.241). The major correlations were directly with whether management planned for exporting, and directly with management's impression of the firm's competitive advantages. No relation was found with management's expectations as to what exporting would contribute to the firm's profits, growth, etc., nor with management's perception of inhibitors (serious obstacles) to exporting. Movement from earlier stages to stage four (experimental export) correlated (R^2 = 0.69) directly with whether the firm received an unsolicited initial export order, directly with the quality of the firm's management and, to a small extent, directly with the firm's size. Again, there was no correlation with management's expectations as to what exporting would contribute to its firm, nor with management's perception of export inhibitors. The proportion of sales exported by stage five (experienced) exporters correlated (R^2 = 0.70) directly with management's perceptions of the gains from exporting, inversely with the number of perceived inhibitors to exporting, and inversely with the quality of the firm's management.

Wiedersheim-Paul, Olson and Welch (1978) investigated the pre-export activities of the firm to determine their importance as an explanation for the initiation of an internationalisation process. They surveyed seventy-five Australian manufacturing firms in five different city locations, more than three-quarters of whom came from a general grouping of engineering machinery and metal manufactures. The respondent firms fell into three main categories: exporting firms (26); non-exporting firms with export experience (14); and non-exporting firms without export experience (35). Their basic assumption was that all firms, initially, are non-exporters and sell to a local market.

Their results reveal that the desire for sales stability with growth was the most frequently mentioned reason for the initial interest in exporting. Whereas the firm is likely to have a number of goals, of particular importance for the firm's export start will be the extent to which it is growth motivated.

Prior to exporting, firms usually expanded inter-state well before their first export sale, and spread inter-state more quickly than did non-exporting firms. More than 40 percent of the firms mentioned either a new product or product superiority as an important factor in their initial export move.

In the Australian case, only the non-exporting firms are examined because exporters were unable to provide sufficient information regarding their pre-export activities. The thirty-five non-exporting firms without export experience that provided usable replies could be divided into three main groups according to their pre-export experience:

(1) Eight firms (23 %) were engaged in active pre-export information activities. All except one had been involved in some form of both information collection and transmission activity.

(2) Five firms (14 %) showed that although they are not currently engaged in pre-export information activities, they had been active in the past. However, in all cases, they replied that they were no longer planning to export and that their withdrawl from an interest in exporting was due to negative feedback from their past efforts.

(3) The final group of twenty-two firms (63 %) replied that they were not planning to export. Also, they had neither transmitted information to, nor collected information about, export markets. In interview, a number of them expressed a genuine sense of surprise that they should be asked questions relating to the export market.

Main Categories of Non-exporters' Pre-Export
Related Information Behaviour

Groups	Planning to Export?	Current	Past
1	Yes	Yes	Not Relevant
2	No	No	Yes
3	No	No	No

These results support the general approach taken to the various types of pre-export activity, ranging from domestic to active.

In an investigation of thirty-five Nebraska-based small manufacturing firms, Lee and Brasch (1978) found that most new exporters followed a 'non-rational decision process'. The purpose of this study was to explore a typical form of the export innovation adoption process as used by business firms.

The following hypotheses were formulated for testing:

1. Among export adopting firms, the problem-orientated adoption process (POAP) is more common than the innovation-oriented adoption process (IOAP).
2. Among export adopting firms, a rational adoption process (RAP) is more common than a non-rational adoption process (NRAP).
3. There are differences between the POAP firms and the IOAP firms, and

between the RAP firms and the NRAP firms in terms of the size and the age of the firms, characteristics of the decision group members, and their perception of the business environment.

The following alternative adoption processes have been hypothesised to exist:

(1) POAP. An adoption process in which the initiating force is one or a combination of interrelated problems such as: mature product, increased competition within the domestic market, decreasing sales or profit, definite desire for market expansion based on a long-term corporate expansion plan, or other comparable problems or needs as perceived by one or more of the decision-makers.

(2) IOAP. An adoption process in which the initiating force has either precise knowledge of the existence of market opportunity in a foreign market for the brand or product, or has technical knowledge of exporting. The information on the existence of a market opportunity or export technique may be passively received from other firms, governmental agencies, banks, middlemen, or potential buyers in foreign countries.

(3) RAP. An adoption process in which the decision-makers use a wide variety of more authoritative sources of information, utilise and value planning and deliberation, keep more complete records, and give specific and economically sound justifications for taking action.

(4) NRAP. An adoption process for which the decision-makers use less authoritative and less varied sources of information, keep less complete records, neither use nor value much planning or deliberation, and do not or cannot give economically sound justifications for action taken.

Among export adopting firms, the POAP is more common than the IOAP (hypothesis 1). Twenty-four firms identified their adoption process as being innovation-orientated, and there were 11 firms whose adoption process was found to be problem-orientated. Contrary to the research hypothesis, IOAP was a significantly more common form of exporting adoption process than POAP among Nebraska manufacturers. This may have been due to the availability of various change agents (government agencies, banks, and other export agencies). Since formal inter-firm communication was apparently rare in the sample, change agents have been active in Nebraska and their work seems to have resulted in a high incidence of the innovation-oriented adoption process.

Among export adopting firms, the RAP is more common than the NRAP (hypothesis 2). The adoption processes for 24 firms were determined to be non-rational, whereas there were 11 firms whose adoption processes were found to be rational. It was concluded that NRAP was significantly more common than RAP among Nebraska manufacturers.

There are differences between the POAP firms and the IOAP firms, and between the RAP firms and the NRAP firms in terms of the size and the age of the firms, characteristics of the decision group members and their perception of the business environment (hypothesis 3). Results indicated that there was a significant difference in age between IOAP firms and POAP firms. Companies that had adopted exporting through IOAP were decidedly younger. The two groups were homogeneous in terms of size, the characteristics of the decision makers, and the perceived characteristics of the environment. Differences between RAP firms and NRAP firms were found in the perception of the overall business environment.

Nearly one-third (31 percent) of the firms under investigation were problem-oriented in adopting an export strategy. It is interesting to note that the ratio of problem-oriented firms was very close to that of an innovation diffusion study by Reynolds (1971). In his study, POAP was used by 30 percent of his sample. It also matches closely the 3:6 ratio found in the Simmonds and Smith export study.

Cavusgil (1981) conducted a research to elaborate on the firm's internationalisation process and to offer some evidence on the critical firm characteristics that facilitate or hinder firms' progression over the internationalisation path. His survey was conducted among a systematically selected group of manufacturing firms in Main and New Mexico. It sought a variety of information from the responding top executives.

His proposition to operationalise the internationalisation stages has already been defined in the previous section of this study. Four groups of variables were delineated and then used in his empirical analysis. Similar to the Cavusgil and Nevin (1981) categorisation (which will be covered in the next paragraph) the groups were identified as differential firm advantages, level of commitment to export marketing, personal characteristics of the decision makers, and management's perceptions of profits and risks in exporting. Differential firm advantages are derived from the nature of the firm's product,. markets, technological orientation and resources. Level of commitment to export marketing was measured by the management's information-seeking behaviour. The two personal decision-maker characteristics included in his study were age and educational background. Finally, managers' perceptions of how profitable and risky export marketing is, compared to domestic marketing, were included as the fourth group of critical variables hypothesised to explain firms' progression over the internationalisation process.

The results of the univariate test (F-test) of differences among the firms in the four stages in terms of the four sets of critical variables discussed above will be explained.

In explaining the progression from stage one to stage two, the following variables seem to be useful. First, new product development capability and product quality are two differential advantages possessed to a greater degree by the stage two firms. These advantages may serve as the initial motivation for management to become interested in exporting. Second, stage two firms appear to be more active in gathering export-related information than stage one firms. Third, both personal characteristics are useful in distinguishing Stage Two firms from Stage One firms. Managers of stage two firms are more likely to be younger and more educated.

It is interesting to note that neither profit nor risk perceptions discriminate between the stage one and stage two firms. This finding, then would add credibility to the hypothesis that, during the firm's initial preparation for or the actual involvement in export marketing, profit motivation does not play a significant role. Non-profit or non-economic motives, such as the desire to exploit excess capacity or an obsolete product, may be dominant.

A large number of statistically significant differences were detected between stage two and stage three firms. Progression to Stage Three appeared to be the results of an expansion in the national market and the possession of a national network of middlemen.

Stage three firms are more likely than stage two firms to enjoy management expertise in marketing and finance. This may be because of the substantial learning involved in export starts. A technologically intensive product is also a characteristic of the stage three firms. In addition, stage three firms have been more active in gathering information on exporting from all four sources.

Interestingly, Stage Three firms (exporters) perceived greater risks and lesser profits in exporting. This is possibly because these firms, relatively new to exporting, find themselves confronted with a number of unexpected hurdles.

Progression of the firm to stage four seems to be facilitated by the presence of a technologically intensive product. A national market orientation continues to be critical. Perceived profits and risks are also important. Stage four firms are more optimistic about exporting than stage three firms. Surprisingly, information gathering from external sources does not help to explain the progression to stage four. This is possibly because the stage four firm, by now, has developed its own marketing intelligence system and does not have to be rely on an outside source of information.

Cavusgil and Nevin (1981) identified several potential internal determinants of export marketing behavior and empirically assessed their significance through a two-stage statistical analysis using the automatic interaction detector (AID) analysis and the multiple classification analysis (MCA). A total of 473 survey questionnaire were returned from 816 manufacturing firms listed in the Classified Directory of Wisconsin Manufacturers (Wisconsin Manufacturers Association 1974).

They identified four groups of factors as likely internal determinants of whether firms engage in export marketing. These groups are similar to the Cavusgil (1981) categorisation discussed above.

One of the most important empirical results of their study is that variations in the export marketing behavior of firms can be explained, to a substantial degree, by differences in internal firm and management characteristics. Export marketing behavior of firms appears to be explainable by the four groups of internal determinants: expectation of management (about the effects of exporting on a firm's growth), level of commitment to export marketing (market planning, policy toward exports, and systematic exploration), differential firm advantages (firm's size, technology intensiveness, and possession of a unique product), and the strength of managerial aspirations (for growth and for security of markets).

The results seem to support the contention that the reluctance of firms to export may be largely attributable to top management's lack of determination to export. A firm's top management should be able to increase substantially its probability of exporting by stressing the importance of growth as an organisational objective as well as the potential positive impact of exporting on growth, and then committing resources to engage in market planning, systematically explore the possibility of exporting and developing an export policy.

Czinkota and Johnston (1981) proposed four major approaches to differentiate firms into groups based on the level of international activities, managerial attitudes, size, and service orientation of firms. They investigated these four segmentation approaches by applying them to common data collected from small and medium sized US manufacturing firms. The classification criteria included export sales volume, length of export experience, types of countries exported to, number of export customers and transactions, personnel committed to exporting, management attitudes, firm size, and service orientation of the firm.

Firms were classified into the following stages: the unwilling firm, the uninterested firm, the interested firm, the experimenting exporters, semi-experienced small exporters, and experienced large exporters.

After experimenting with four alternative ways of segmenting firms, they concluded that differentiation based on the internationalisation stages provides the best approach. They noted, however, that differentiation of firms according to size requires the least amount of information and may be the best approach to use for identifying firms for unilateral assistance programmes.

Ending this survey of literature on the internationalisation process and its applications, some general and brief conclusions can be drawn. First of all, there is no single acceptable and unique approach to explain the internationalisation process since each one deals with certain aspects and, accordingly, no common model has been developed from the various empirical findings. Concerning the export behavior of firms, the survey shows as follows:

1. Learning theory is applicable to the export development process.
2. Government programmes for increasing manufactured exports should consider two foci that can be conceptualised in terms of an aggregative export supply curve. One focus is to move upward along the export supply curve by making exporting more profitable. The second focus is to shift the export supply curve to the right - by increasing managements' international interests, by obtaining

export orders for firms, by instituting management development programmes, by removing perceived barriers-to-exporting, and so on.

3. Closely related to the above inference is that a government seeking to stimulate manufactured exports probably would find it desirable to undertake a complex of programmes, so that something would be appropriate for firms at each stage of the export development process.

4. To the extent that the specific findings obtained can be generalised, managements interested in exporting should;
   - follow through on whatever unsolicited export orders arrive, for they can be a means of shortening the firm's export development process.
   - formulate an export policy.
   - formulate an export plan.
   - make some person or department specifically responsible for the firm's export development.
   - direct the firm's initial export efforts to psychically close countries; then, as experience is gained, extend exporting to psychically more distant areas.
   - search for information regarding relevant export barriers, to be aware of what must be overcome during the firm's export development process.
   - develop exporting on a step-by-step basis to progress rationally from one export stage to the next.

5. This survey indicated that small-and medium-sized firms can export successfully; exporting is not limited to large firms.

It can be also said that more research is still needed in this area, mainly as to those conditions and the methods by which conflict can be relieved and replaced by more co-operation and understanding so as to maximise the benefits of each party, taking into account the respective interests and priorities of both parties.

2.2.3 Internalisation Theory

The constant risk to the MNEs is that their firm specific advantage may be dissipated by inappropriate contractual arrangements such as premature licensing. In particular, MNEs need to have centralised control of their R and D function and, to prevent the risk of dissipation of firm specific advantages in technology, they should attempt to achieve this by running an integrated internal market.

Rugman (1981) tested the theory of internalisation in a Canadian case study in the specific context of technology transfer to Canada by US MNEs. He investigated data on the relative R and D expenditures in a sample of foreign owned subsidiaries versus independent Canadian firms, using the theory of internalisation.

The theory and test results help to explain why there is very little indigenous R and D in Canada, why the MNE has a prospensity to prefer foreign direct investment to licensing and why Canadian technology lags behind that of the USA, Japan and Europe.

The very point of internalisation theory is that R and D is determined within the multinational firm. Theory predicts that decisions on R and D in Canadian subsidiaries are not made within a Canadian context alone but are made by parent multinationals as part of their micro global investment strategy.

The basic hypothesis examined is that the R and D undertaken by subsidiaries is less than that of independent Canadian firms. The lack of R and D in subsidiaries can be explained by the theory of internalisation, which states that subsidiaries exist to extend abroad the firm-specific advantage of the parent firm. The MNEs choose to regulate the use of their advantages through an internal market when the net benefits of internalisation exceed those of alternatives such as exporting or licensing.

He divided the 35 firms from his survey into two groups; a) independent Canadian firms and b) subsidiaries of MNEs. Next the parent firms of the subsidiaries were identified, to form a third group c) the parent multinationals.

In a statistical analysis, no significant differences were found between the respective means of the three samples, i.e. between 3.12, 2.07, and 1.19 on an F test. There was no significant difference between the mean of R and D to sales ratio of the parent firms (3.12) and that of the corresponding Canadian subsidiaries (2.07). Similarly, there was no significant difference between the means for the subsidiary and independent Canadian-firms. The mean ratio of R and D to profits (given as percentages) show no significant difference between the mean ratio of parent firms (60.27) and that of their Canadian subsidiaries (41.43). Similarly, the mean ratios of R and D to profits for parent and Canadian-owned firms (29.78), and for Canadian subsidiaries and Canadian-owned firms, proved to be insignificantly different.

In nine of the twelve cases the R and D to sales ratio of the parent firm exceeded that of its subsidiary. Yet there is no statistical support for the hypothesis that the mean ratio of R and D to sales is less for the sample of subsidiaries than for their parent firms since the difference is not significant on a t-test. Neither is there statistical support for the proposition that independent Canadian firms do more or less R and D than foreign-owned manufacturing firms operating in Canada. The same findings apply to the ratio of R and D to profits. However, there is significantly more R and D undertaken by parent US multinationals than by independent Canadian firms. This offers some support for a prediction of the internalisation theory, namely that innovations occur in the nation of the parent firms, rather than in the nation of its subsidiaries.

2.2.4 The Eclectic Theory of International Production

Dunning (1980) suggests that the possession of ownership advantages determines which firms will supply a particular foreign market, whereas the pattern of location endowments explains whether the firm will supply that market by exports (trade) or by local production (non-trade).

There have been five approaches to test the theory of international production. The first has attempted to explain the causes of direct foreign investment by examining its industrial composition from the viewpoint of individual home countries (almost exclusively the US) and host countries (notably Canada, UK, and Australia). The second approach has been to look at the form of international economic involvement and to identify the determinants of whether foreign markets are exploited by trade or non-trade routes. The third has combined the two approaches by examining both the level and composition of international involvement in terms of ownership and locational characteristics. The fourth approach has been to extend the first three to incorporate the internationalisation thesis; and the fifth has been to relate the specific endowments of firms to those of home countries.

Dunning (1980) considered only two forms of international economic involvement (exports and production) in testing empirically two of the most important hypotheses implicit in the eclectic theory of international production. These are assumed to be alternative to each other in servicing foreign markets. The data used by him cover the foreign activities of US multinationals in fourteen manufacturing industries in seven countries in 1970, as published by the US Tariff Commission (1973). The two basic hypothesis are:

H_1 The competitive advantage of a country's enterprises in servicing foreign market is determined both by the ownership advantages of enterprises relative to those of enterprises of other nationalities, and to the location advantages of the countries in which they produce relative to those of other countries.

H_2 The form of involvement, or participation, will essentially depend on the relative attractiveness of the location-specific endowments of the home and host countries.

Concerning H_1, he took as his dependent variable the share of the output of a particular industry (IS) in a particular country supplied by exports (X) plus local production (AS) of US-owned firms: AS+X/IS. This dependent variable is noted as DV 1. The two components of international involvement may be considered separately. DV 2 signifies the share of the affiliates' sales of total output in the host country (AS/IS), and DV 3 the share of exports from the US of that output (X/IS).

Concerning H_2, the dependent variable-DV 4 is defined as X/IS+AS/IS (or simply X/AS); in other words, it is a ratio showing the exploitation of a particular market by exports from the US relative to local production by US affiliates. The higher this ratio, the more the US is favoured as a location for production relative to the country in which the goods are being sold (or being exported from).

Dunning used twelve independent variables, which are: 1) access to productive knowledge; 2) economics of the firm; 3) opportunities for investment; 4) diversification indices; 5) market concentration; 6) efficiency; 7) resource availability; 8) product differentiation; 9) oligopolistic behavior; 10) production costs; 11) transfer costs; and 12) political risks. The variables 1) to 9) include ownership advantages and the rest location advantages.

It would not be surprising to find that different factors explain the absolute and relative success of US exports and affiliated production in the seven countries (Canada, United Kingdom, France, West Germany, Belgium-Lux, Mexico, and Brazil) when tested individually. These countries vary quite considerably in income levels, economic structure, political ideologies, culture, proximity to the US, and the extent to which they, themselves, spawn MNEs which compete in international markets with US-based MNEs.

The statistical results in the seven countries show that the main advantages of US firms are revealed in one location-specific variable-relative market size (RMS)-and one ownership-specific variable-the skilled employment ratio (SER). This latter ratio may be used as a proxy for internalised advantages. Both are consistently significant at the 99.0 % level for each of the dependent variables. The other ownership variables which are significant at this level for DV 1 and DV 3 are the productivity index, relative sales per man (RSM) and average hourly compensation (AHC). Two location-specific variables-wage differentials (RW) and net income per sales (AVNIS)-are also significant for the same two dependent variables, but only at the 95.0 % level. For DV 2, no variables other than RMS and SER were significant, although average hourly compensation (AHC) came closest. The results obtained from H_2 are quite different from those of H_1. Two variables, the export/import ratio (XMR) and net income to sales (AVNIS), are consistently significant at the 99.0 % level and explain nearly 60.0 % of the variation in the location ratio. Growth of relative sales per man (GRSPM) comes very close but is never quite significant.

Only the statistical results from five countries are discussed here since Mexico and Brazil were excluded by Dunning (1981). One ownership variable, the skilled employment ratio (SER), and two location variables, relative market shares (RMS) and average hourly compensation (AHC), are consistently significant at the 99.0 % level. These three variables clearly have some influence on both US trade and affiliate success in each of the five countries. Relative export shares (RES) and relative wages (RW) appear significant at the 95.0 % level in some equations of DV 2 and DV 3, but only where there are few independent variables regressed together. This suggests that these latter two location variables exert some influence on the competitiveness of US trade but not of foreign production. The tariff variable (T) appears to be a significant explanation of the overall involvement of US firms in the five countries. In combination with the three universally successful variables above (RMS, SER, and AHC), T yielded an R^2 of

0.5695, which is quite satisfactory. The results obtained from H_2(DV 4) show as follows: The net income per sales (AVNIS) and the growth in sales per man (GRSPM) are consistently significant. These two alone explain more than half the variance in the location ratio. Other variables which are occasionally significant are two ownership variables, average hourly compensation (AHC) and relative sales per man (RSM). They are only significant in small groups, however, which suggests an overlap between many of these variables.

CHAPTER 3

RESEARCH METHODOLOGY

It is essential to construct an overall research design to meet the research objectives posed in Chapter 1. The proposed design aims at testing the theoretical assertions against the factual context of plant and construction firms and their environment. This chapter provides a detailed account of research design and methods, field of application, data collection, sample selection and characteristics and statistical techniques used. Thus, the methodological issues discussed include:

3.1 Working definitions.

3.2 Field of application.

3.3 Hypotheses of the study.

3.4 Research and data collection methods.

  3.4.1 Primary data (survey).

  3.4.2 Secondary data.

3.5 Sample characteristics.

3.6 Statistical techniques used to analyse data.

3.1 WORKING DEFINITIONS

Before proceeding with further discussions of research methods, it would be desirable to define the six major relevant concepts which are frequently used in the following chapters. These terms are: risk, contract, contract strategy, tender, comparative advantage and competitive advantage.

(1) Risk is used here to mean the possibility of an unforeseen event (determined by some objectively verifiable probability distribution) that detracts from a sustained export performance in the plant and construction industry.

(2) Contract is defined as a business agreement between parties relating to the supply of goods or the performance of work at a specified price (Concise Oxford Dictionary).

(3) Contract strategy in this study means any organisational or contractual policies which are chosen for the execution of a specific project (Perry, 1985).

(4) Tender means an offer in writing to execute work or supply goods at a fixed price (Concise Oxford Dictionary).

(5) Comparative advantage is generally defined in this study as a relative trade (in particular, export) performance reflecting inter-country differences in the efficiency of individual industries. Thus, the comparative advantage of a specific country is estimated by its relative costs as well as the influence of non-price factors, such as goodwill, quality and the availability of servicing and repair facilities.

(6) Competitive advantage is taken to refer to a firm's relative

position, stemming from the many discrete activities a firm performs in designing, producing, marketing, delivering and supporting its product. There are two basic types of competitive advantage: cost leadership and differentiation (Porter, 1985).

3.2 FIELD OF APPLICATION

The empirical work of this study relates to a chosen sample of Korean and non-Korean firms in the plant and construction industry sector. Our concern here is to explain the choice of plant and construction firms as a field of study.

Two major factors influenced the choice of the plant and construction industry: a) The plant sector maintains the highest value added among the major Korean export industries, thus playing an important role in Korean economic development, but since 1985 the value of Korean plant exports has markedly decreased, as can be seen from Table 7.7; and b) Korean overseas construction exports have contributed greatly to the improvement of the balance of payments and to the growth of the national product and employment in Korea by supplying manpower and machinery and parts to overseas construction sites. The value of Korean construction exports, however, has also markedly decreased since 1982 (see Graph 7.4).

Under these circumstances, an investigation into the strategies available to the Korean plant and construction industry to improve its export performance represents an important field of empirical investigation. It is also expected that tests of the hypotheses posed in section 3.3 will aid in suggesting modifications to corporate Korean export strategies and to governmental export policies in support of an improved export performance. In particular, an evaluation of the success or failure among tenders, risk management, contract strategy and international competitiveness of plant and construction firms can be expected to have policy implications for the Korean industry.

Primary data was collected through a comprehensive questionnaire survey administered to plant and construction firms in twelve countries, including Korea, allowing cross-country (between Korea and other countries) and cross-industry (between plant and construction) analyses to be conducted.

3.3 RESEARCH HYPOTHESES

Based on a survey of the literature in Chapter 2, and taking into account previous theoretical propositions and data, there are a number of hypothetical propositions which this study will proceed to investigate in pursuit of an appropriate strategy for improvements in the competitiveness of the Korean plant and construction industry in international markets. These hypotheses are as follows:

(H1) The value of Korean general plant exports is a function of the level of investment in R & D. Under the "long-term" plan, the Korean government proposes to increase R & D investment from 1.7 % of GNP in 1985 to 3.0 % by 2001 (*Korea Newsreview*, December 28, 1985). Officially, the value of overseas construction exports is not expected to decrease below the value of 1987 (US$ 2.1 billion). Rather, increases are expected, even though a strong upturn in oil prices in the Middle-East (which has been the most important market for Korea) is not forecast in the near future, because Korean overseas contractors are expected to win an estimated US$ 1.5 billion worth of contracts in Iran for post-war reconstruction projects (Korea Newsreview, November 12, 1988).

(H2) Korea is inferior to the developed countries in design ability, information collecting ability, technology and quality and payment conditions, but enjoys a comparative advantage with respect to date of delivery. The most important impediment to her development as an international competitor originates from a low technological level. A low technological base and a lack of tender experience are regarded as important factors in any failure to bid successfully for installations which require a comparatively high technological level. On the other hand, in low technological projects and industries, fund related matters (price and payment conditions) and factors such as date of delivery and excessive competition among native firms are presumed to be more important impediments to success in international markets.

(H3) 'Bid failures' by industrial plant exporters are hampered by low technology, lack of information and lack of tender experience compared with overseas construction firms. Construction firms will be hampered more by price disadvantages and a lack of design ability. This is because of the widespread practice among international competitors of resorting to 'price-dumping' tenders (based on low wages) from the effects of declining oil prices on the Middle-East market.

(H4) Export success or failure in plant and construction markets is assumed to be explained both by firm size and by various qualita-

<u>tive variables</u>, such as mutual economic cooperation, quality guarantees of products exported and financial arrangements in the case of export success; and weak political and diplomatic relations, lack of bid experience, low technology and lack of mutual economic cooperation, etc. for export failure. In addition, at least one dummy variable to represent export activity (plant or construction) is assumed to add to the explanation of export success or failure.

(H5) <u>Korean plant and construction firms are assumed to experience more technical and financial risks compared with non-Korean firms.</u> Both Korean and non-Korean firms have experienced most risk in the Middle-East, followed by South-East Asia and Africa, the regions where their exporting has mainly occurred.

(H6) <u>The most important incidental condition which is requested at the time of contract is for funds to service the contract.</u> Most of the contracts tend to be turn-key contracts in which the supplier is required to offer technology and guidance and training at each stage, from initiation through to completion. Requests for counter-trade from importing countries can be expected to increase and the "tie-in clauses" that advanced countries insert into contracts with Korea will continue to impede technology transfer.

(H7) <u>In tender preparation the firms from developed countries will carry out more competent estimating work than Korean firms in support of their tenders.</u> It is assumed that the developed country firms prepare more accurate and concise contract documents than Korean firms, including the clarification of areas of responsibility and the unambiguous allocation of risks.

(H8) <u>Developing countries will continue to usurp comparative advantage</u>

previously enjoyed by Korea in low-technology activities, requiring Korea to restructure her plant exports in favour of high-technology products. International competitive power may be influenced by variables such as price competitiveness (calculated by a relative price comparison of domestic and international prices) and non-price competitiveness. The latter consists of technology, payment conditions, date of delivery, after-sales service, design ability, information collecting ability and quality etc. In accordance with the requirements of the latest trend for large projects requiring complex technology, it is assumed that the advancement of technological standards is central to international competitive power.

(H9) A comparison of the international competitive power of plant exports by "revealed" comparative advantage will show that trade patterns are determined largely by inter-country differences in relative costs, and that labour costs greatly affect the determination of comparative advantage.

(H10) Export performance in the plant and construction industry tends to be associated with the strength and dominance of ownership-specific advantages or locational factors, respectively.

3.4 RESEARCH AND DATA COLLECTION METHODS

The study has been conducted at the national level and at the level of the firm. At the national level, it is proposed, firstly, to investigate the status of industrial plant and construction exports in Korea relative to the developed countries, within a theoretical framework of internationalisation; and, secondly, to suggest strategies to improve the performance of plant and construction exports. Various sociological, economic, political and technological considerations that function within the Korean environment will be considered. The second part of the analysis will be carried out at the level of the firm (through a chosen sample) to assess the international competitive power of the Korean plant and construction industry.

By using this macro-level approach to diagnose the Korean environment, the study gives attention to social, economic and technological environmental variables in developed countries. Our concern here is to point out those commonly shared attributes by many developed countries and those unique to Korea. This will help to assess the export performance of the plant and construction industry in Korea and developed countries.

The empirical work at the firm level will involve the choice of a sample of firms drawn from the plant and construction industry in Korea and 11 other countries. Relying upon data obtained through questionnaire, interviews and documentary sources, an inductive approach has been employed to tackle the major research questions and to provide empirical evidence in the light of the hypotheses cited earlier. Accordingly, both primary and secondary data is required of both a factual and an attitudinal nature.

3.4.1 Primary Data (Survey)

The survey method was adopted to determine the attitudes of plant and construction firms with regard to: a) factors influencing the success or failure of tenders; b) risk management; c) contract strategy;

and d) international competition. The questionnaire and interview seems to be the most frequently adopted methodology used in the majority of studies which have been reviewed in the literature survey. This approach proved to be especially useful in finding out the perceptions of project and sales managers of the international competitiveness of Korean firms and the problems that Korean firms face in exporting their products to foreign countries. Although surveys based on attitude questionnaires may suffer from certain limitations, they can serve as a useful tool in studying the environment and characteristics of the firm and to provide useful guidelines for policy recommendations (as suggested and discussed in the last chapter of this study).

Data on the attitudes of the plant and construction firms concerning the issues of this research was obtained through a questionnaire, designed for and directed to the general managers or managing directors of the plant and construction firms studied. Its main objective was to investigate the quantitative and qualitative side of the data which could then be subjected to statistical analysis. This questionnaire covers four major areas (a copy of this questionnaire is appended): a) factors influencing the success or failure of tenders for plant exports/ overseas construction projects; b) risk management, incorporating risk identification, analysis and response; c) contract related elements (such as tender appraisal, conditions of contract and contract strategy); and d) various elements of competitiveness (such as competitive strategy, technology transfer, global competitive advantage and weaknesses in the educational system).

3.4.2 Secondary Data

Secondary official sources were approached for the provision of factual aggregate data. Data about the Korean plant exports (i.e. overall statistics) was obtained from the Ministry of Trade and Industry, the Korea Society for the Advancement of Machine Industry (KOSAMI), the Federation of Korean Industries and the Korean Trade Promotion Corporation (KOTRA). The trade statistics of the OECD and the UN were approached for data on plant exports of developed countries. Aggregate data on the construction exports of Korea and major countries was acquired from the Engineering News-Record, the Ministry of Construction and the Overseas Construction Association of Korea (OCAK). The data relates to exports, technology, general economic indicators and finance, with special reference to the plant and construction industry.

The Ministry of Science and Technology, Korea Institute of Economics and Technology (KIET) and Korea Industrial Research Institutes (KIRI) supplied data on international trends in technology transfer and the current situation of technology transfer in Korea. The Economic Planning Board and the Korea Development Institute (KDI) provided data on the contemporary Korean economy, and the International Monetary Fund (IMF) on the comparison of economic indicators between Korea and other countries. The Export-Import Bank of Korea provided data on project financing associated with external economic cooperation, deferred-payment funds and export insurance.

In addition to these official sources, a large body of studies, reports and conference proceedings have been useful in providing a great deal of relevant secondary data which helped enrich the analysis and the quality of arguments.

Factual secondary data, which was helpful in interpreting primary data, enabled us to abstract objective independent variables to study and analyse the subjective attitudes given by our respondents. In addition, a historical and comparative analysis was employed at the micro and macro levels to explore relevant aspects which may be helpful in exploring some research questions.

3.5 SAMPLE CHARACTERISTICS

This section presents a general analysis of the chosen sample, its characteristics and the criteria for this choice.

Table 3.1 illustrates the distribution of the original sample and the responding firms by country and industry. Initially, a sample of 139 firms (47 Korean and 92 non-Korean firms) was chosen from the population, drawn from the top 160 international contractors (in 1985) as identified by the Engineering News-Record in the case of foreign companies, and among the top 250 (between 1983 and 1985) in the case of Korean construction firms. An original sample of Korean plant firms was drawn from those which were registered with the Korean Ministry of Trade and Industry at December 1986.

The actual number of firms for which full information at a sufficient level of disaggregation was obtained was 62, a response rate of 44.6%. Of these, 42 firms were drawn from Korean plant and construction firms and the remaining 20 firms from 11 other countries. The structure of responding firms by industry shows a total of 29 plant exporters and 33 construction firms. Fifty firms came from three countries, Korea, the USA and Japan (accounting for 80.6% of the total responses).

Table 3.1

SAMPLE STRUCTURE BY COUNTRY AND INDUSTRY

Country	Original sample		Responding firms[1]				
	N (A)	%	plant	constrn	total(B)	%	B / A(%)
Korea	47	33.8	23	19	42	67.7	89.4
USA	16	11.5	2	3	5	8.1	31.3
Japan	17	12.2	1	2	3	4.8	17.6
UK	10	7.2	0	1	1	1.6	10.0
W. Germany	10	7.2	1	1	2	3.2	20.0
France	10	7.2	0	1	1	1.6	10.0
Italy	10	7.2	2	1	3	4.8	30.0
Belgium	2	1.4	0	1	1	1.6	50.0
Turkey	3	2.2	0	1	1	1.6	33.3
Sweden	2	1.4	0	1	1	1.6	50.0
Taiwan	1	0.7	0	1	1	1.6	100.0
Singapore	1	0.7	0	1	1	1.6	100.0
Austria	1	0.7	0	0	0	0.0	0.0
Greece	1	0.7	0	0	0	0.0	0.0
Netherlands	4	2.9	0	0	0	0.0	0.0
Canada	2	1.4	0	0	0	0.0	0.0
Switzerland	2	1.4	0	0	0	0.0	0.0
Total	139	100.0	29	33	62	100.0	44.6

Note: (1) A list of the 62 sample firms: see Appendix 3.

To increase the response rate of Korean firms, the author visited Korea in February 1987 and collected a great deal of survey (response rate: 89.4 %) and secondary data with the support of the Ministry of Trade and Industry and the Ministry of Construction, Korea. To increase the response to a mailed questionnaire to non-Korean firms, the author visited the Korean Embassy in London. With the support of Korean Commercial Attache (a copy of the official letter is appended) a fairly high response rate of 21.7 % was achieved.

As referred to earlier, to enhance the qualitative side of the analysis, 14 structured interviews were held with governmental officials, managing directors and sales engineers[1].

3.6 STATISTICAL TECHNIQUES USED TO ANALYSE DATA

Data analysis was carried out using a number of SPSS statistical techniques. Various statistical models were employed to determine the pattern of relationships among variables and whether the expected pattern of relationships can actually be discerned in the data. The attitudes and views revealed by respondents to the questionnaire were analysed using 15 objective variables[2] and 417 subjective variables. The statistical procedures used were:

(1) **FREQUENCIES**: This procedure was used to examine the distributional characteristics of the variables under investigation through the calculation of the descriptive statistics and the generation of tabular reports. It also served as a basic computer reference document for all the variables.

(2) **PEARSON CORRELATION**: This subprogram computes Pearson correlations for pairs of variables. The Pearson correlation coefficient r was used to measure the strength of relationship (between two interval-level variables), which indicates the goodness of fit of a linear regression line to the data. 20 variables were included in this procedure (V7 to V19 and V24 to V30).

(3) **CROSSTABS**: This subroutine produces cross-tabulation tables which allow an investigation of sets of relationships among the variables. This procedure was helpful in analysing dependent attitude variables by relating them to independent variables. The output of such joint frequency distributional relationships made it possible to summarise the relationships obtained and to subject them to certain simple statistical techniques in order to reach some meaningful indicators. In addition, "**CROSSTABS**" provides some useful statistics. Among them we used: a) **CHI-SQUARE**; a test of statistical significance, which helps to test hypothetical relationships among variables and whether a systematic relationship exists between two variables; b) "**CRAMER'S V**" statistics, which measure the strength of the association among variables.

(4) **FACTOR ANALYSIS**: This is a generalised procedure for locating and defining dimensional space among a relatively large group of variables. The major use of factor analysis by social scientists is to locate a smaller number of valid dimensions, clusters or factors contained in a larger set of independent items or variables. Factor analysis can help determine the degree to which a given variable or several variables are part of a common underlying

phenomenon. 37 variables were included in this procedure to identify factors in the success or failure of tenders for plant exports and 13 variables were used for construction exports (Chapter 8).

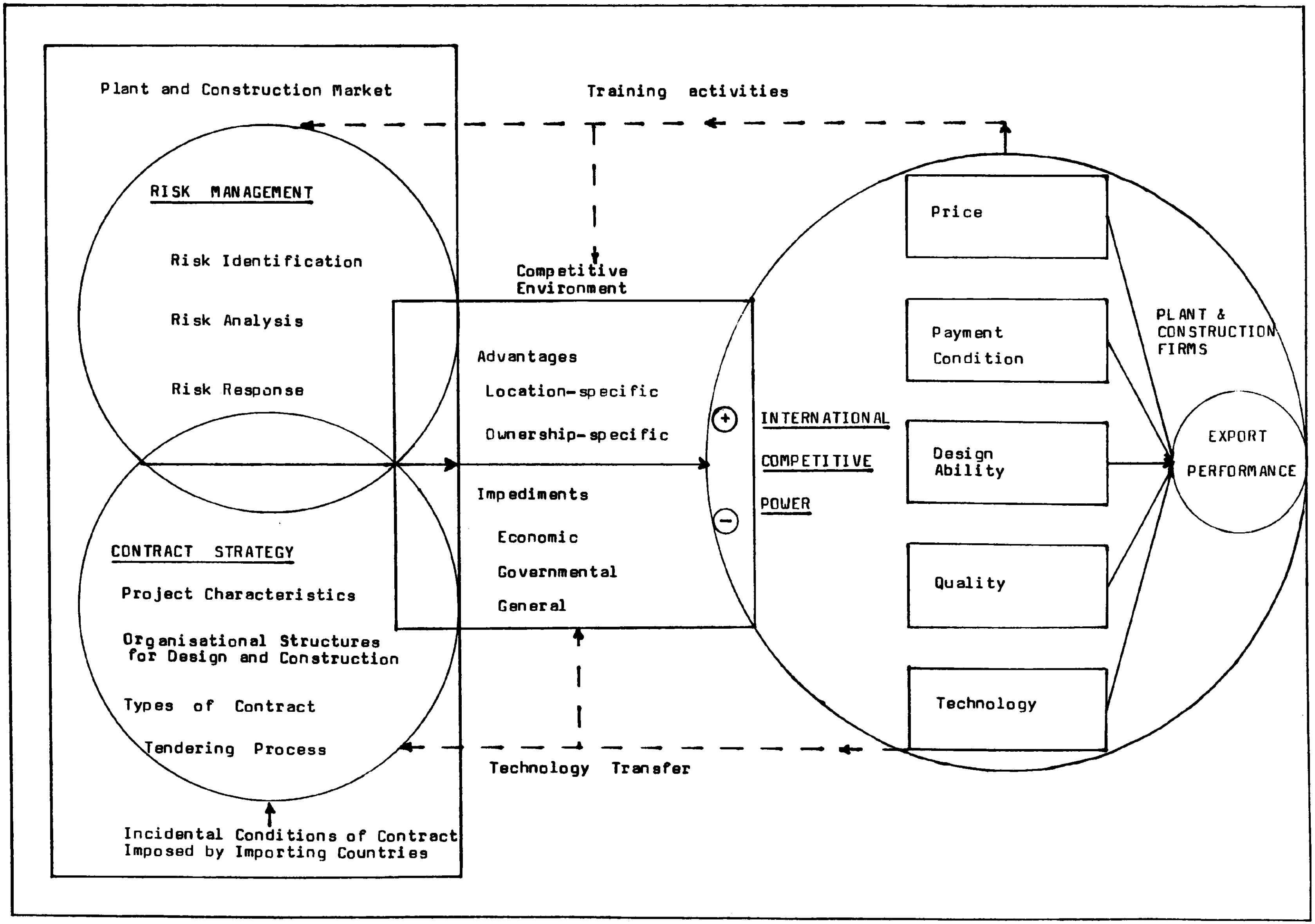
(5) **DISCRIMINANT ANALYSIS:** This was extensively employed to determine whether statistical differences exist between country groups (Korea and other countries) and between industry groups (plant and construction firms). This procedure was used to identify the independent variables which explain most of the differences between groups.

In addition to the above five statistical procedures, one more procedure was utilised for interval data (see Table 8.49 to 8.52). The creation of an interval data file enabled us to study the relationships among variables using **MULTIPLE REGRESSION**. The employment of this procedure allowed for the examination of the linear relationship between a set of independent variables (such as number of employees, sales volume, mutual economic coöperation and financial arrangements) and a dependent variable (such as export volume). Certain interesting findings were reached when the success and failure of tenders for plant and construction exports in the sample were examined by multiple regression to produce a linear combination of independent variables which correlate as highly as possible with the dependent variable.

3.7 SUMMARY AND CONCLUSION

In the light of the research objectives (Chapter 1), theoretical perspectives (Chapter 2) and hypotheses posed earlier, it can be said that the empirical investigation of this study deals with the relationship between environmental locational variables and the export performance of plant and construction firms. More specifically, this relationship was examined by studying the success and failure of tenders, risk management, contract strategy and the international competitiveness of plant and construction firms. Figure 3.1 illustrates a wide environmental framework which accommodates mutual integration between plant and construction firms and the factors which can determine the extent of export performance. Competitive environmental forces were dealt with to explore their effects on risk management and contract strategy in the plant and construction markets. However, most attention was given to the role of the Korean plant and construction firms in improving their international competitive power and export performance.

Figure 3.1 Plant and Construction Firms within a Wide Environmental Framework



NOTES

1. Including an extensive interview with the manager of the marketing division of the Daelim Engineering Company to discuss problems associated with plant exports from Korea and policy recommendations to the Korean government.

2. Those variables are: export activity (V4); nature of a firm's operation (V5); industrial sector of representation (V6); export volume (V10); distribution of annual output (local market, V24 and foreign market, V25); export activity compared with Korean firms (V233); number of employees (V7 and V432); issued share capital (V8 and V433); sales volume (V9 and V434); and ratio of R & D expenditure to sales (V11 and V435).

CHAPTER 4

THE CHARACTERISTICS AND NATURE OF THE PLANT AND CONSTRUCTION INDUSTRY

In order to attain the research objectives posed in Chapter 1, it was felt necessary to specify the definition, classification and characteristics of the plant and construction industry. The chapter falls into two sections:

4.1 The nature and characteristics of plant exports.

4.2 The nature and characteristics of the construction industry.

4.1 THE NATURE AND CHARACTERISTICS OF PLANT EXPORTS

This section discusses the definition, classification and characteristics of plant exports.

4.1.1 GENERAL CONCEPT AND DEFINITION

General Concept

According to a narrow definition, plant exports consist of industrial plant plus the export of heavy machinery (hardware parts) and technology (software parts), such as know-how and consultancy services associated with the sale of hardware parts. Exports of heavy industry, such as steel, oil, chemicals and ceramic plant and those of light industry, such as paper manufacturing and textile plants, are included in this definition.

A broader definition of plant exports includes exports to LDCs of dams, bridges, harbours, irrigation facilities and land development, and infrastructure projects such as hospitals, houses and schools. Thus, the broad definition of plant exports can be briefly outlined as follows:

1. Industrial plant exports
   a. Installations for direct production activities:
      steel and iron, chemical, and textile industrial plant, etc.
   b. Social indirect capital installations in a narrow sense:
      power generating, electrical transmission and distributing installations;
2. Infrastructure exports to LDCs: roads, bridges, dams, and harbour facilities:
3. Other exports to LDCs:
   a. Communication plant: i.e. wire/wireless facilities, communication offices and communication satellites;
   b. Sanitary facilities for common benefit, and machinery and parts for urban development.

<u>This broad definition is derived from the Korean Law for Promoting Industrial Plant Exports (no. 3123 December 5th, 1978) and its Enforcement Ordinance</u>

Industrial plant is defined as machinery and installations established to operate mining, manufacturing, electrical and gas, broadcasting and communication industries, and installations designated by presidential ordinance. Installations ordered by turn-key together with overseas construction work are excluded. Industrial plant is defined as follows: 1) structural installations of iron and steel; 2) structural installations on water; 3) installations for anti-pollution; 4) installations for handling water available for use and for desalinising sea water; 5) freezing and refrigeration installations; 6) air harmonising installations; 7) storage tank and storage site installations; 8) oil supply installations; 9) fixed-style installations for transport, loading and unloading; 10) fixed-style installations for construction; and 11) experimental research installations.

Plant exports are recognised as 1) industrial plant exports in which the proportion of machinery and parts produced within the home country exceeds a fixed value (F.O.B. price equivalent to US 100,000 dollars) established by the Minister of Trade and Industry of Republic of Korea and 2) the exports of technology services and construction related to such plant.

4.1.2 CLASSIFICATION OF PLANT EXPORTS

The Structure of the Plant Export Sector

The plant export sector consist of five industries: 1) engineering; 2) machinery; 3) construction; 4) consultancy; and 5) trade. The engineering industry incorporates feasibility studies, planning, and design etc.; the machinery industry, the manufacturing, assembling and installation of machines etc.; and the construction industry includes civil engineering and infrastructure development. Consultancy refers to broad technology services including project design, feasibility studies, planning, fund-raising and consortia and partner selection. It includes supervision, payment and training in the construction phase, testing, ex-post facto management, education and training in the start-up phase. Trade relates to a multitude of commercial transactions necessary to organise the elements of plant exports as shown in Figure 4.1.

Plant Exports Classification and Statistics

Except for Japan, OECD member countries do not break down the statistics related to plant exports as a whole. The Standard International Trade Classification (SITC) allows a general comparison to be made.

Plant exports are classified by SITC as follows:

- Heavy machinery
  - Plant
    - General Plant (refer to Table 4.1)
    - Shipping
  - Transport machinery

Figure 4.1: The elements of plant exports

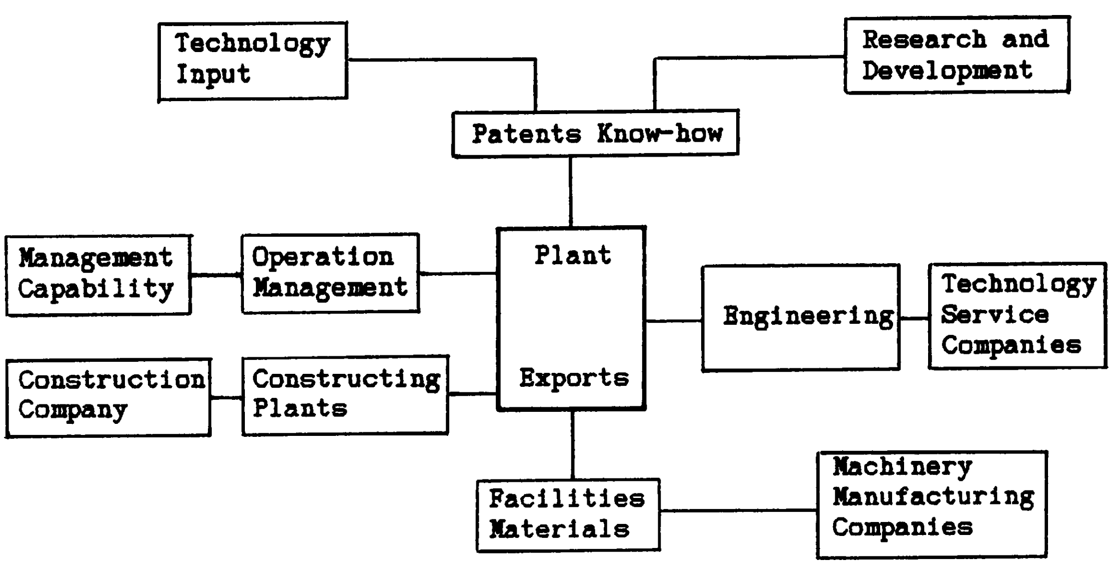


TABLE 4.1

GENERAL PLANT CLASSIFICATION BY MACHINE-TYPES

By Machine-types	S I T C NO.	
	-1975	1975 Revision II
General Plant Total	1 - 3	1 - 3
1. Railway Vehicles	731	791
2. Aircraft Etc	734	792
3. Other General Plant	a - j	a - j
a. Power Machinery Non-Elec	711	71 (exclude 716)
b. Agricultural Machinery	712	721, 722
c. Metalworking Machinery	715	73
d. Textile & Leather Machinery	717	724
e. Machines for Special Industries	718	723, 725, 726, 727, 728
f. Machines NES Non-Elec	719	74
g. Elec Power Mach, Switchgear	722	716, 771, 772
h. Electr Distributing Machinery	723	773
i. Telecomm Equipment NES	724.9	764
j. Structures, Parts Iron, Steel	691.1	6911

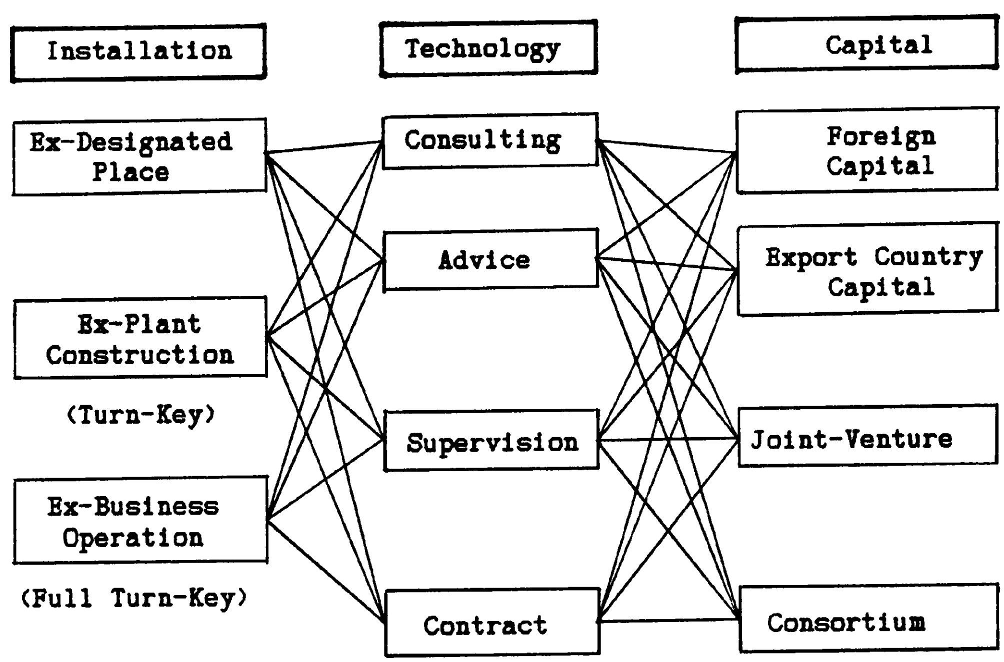
Source: Korea Institute For Economics & Technology (KIET), Special Analysis Series (December 29th, 1979).

In the case of Korea, since 1979 the Ministry of Trade and Industry has estimated separately the statistics of plant exports deemed to be permissible by a law promoting industrial plant exports (enforced on December 5th, 1978). Between 1973, the year plant exports took off, and 1979 no formal statistics were collected. For this reason, in this study, SITC based exports and permissible plant exports as estimated by the Ministry of Trade and Industry will both be used for comparison with OECD countries.

The Plant Exports System

Within the framework of the general classification, installation, technology and capital can be considered as three elements representing an inter-related system as portrayed in Figure 4.2.

Figure 4.2: The Plant Exports System



Installation exports can be classified in three ways: 1) The export of plant construction and materials, machinery and tools for on-the-spot construction and assembly; 2) The export of minimum key equipment, the remainder being produced on-the-spot; and 3) A combination of 1) and 2). Delivery may be specified as ex-designated place, ex-plant construction (turn-key), or ex-business operation (full turn-key).

Technology, as embodied in patents, know-how and engineering, which accompanies installation exports, can be classified according to consulting, advice, supervision and contract. In the event that a capital input is associated with plant exports, it may take one or more of the following forms: foreign capital, export country capital, joint-venture and consortium.

4.1.3 THE CHARACTERISTICS OF PLANT EXPORTS

The plant industry has a number of general characteristics as follows:

1. The plant industry must conform to buyers' specification, whether in the feasibility and design stage, in the manufacturing, assembling and installation of the machinery, test-runs and training technicians on-the-spot.
2. Added-value is high in design and engineering construction parts. Indeed, the plant industry maintains the highest value-added among the major export industries.
3. The plant industry is heavily dependent on skilled technicians to produce machinery, tools and software parts and to operate and construct work on-the-spot, and for process management.

4. The efficiency of resource consumption is high. Efficiency is defined as the amount of added-value produced by investing one unit of resources. Since the added-value rate of the plant industry is relatively high compared with iron and steel, basic chemistry and light industries such as textiles, etc., the amount of resource consumption per added-value unit is low.
5. The spin-off plant exports create for related industries, especially the machinery industry, is relatively higher than that created by personal consumption expenditure, non-government investments, governmental public investments and all other exports. Thus, the employment creating impact of plant exports is also high.
6. The length of time from initial order to final payment makes the plant industry heavily dependent on financial resources.

Apart from these general characteristics, the export sector has a number of specific features, briefly summarised as follows: 1) Industrial plant exports, because of their contribution to industrialisation in the importing country, are rarely subject to trade barriers. 2) Since technology and capital exports through joint-venture and suppliers' credit are comparatively easy to arrange, there tends to be a high degree of economic co-operation between trading partners. 3) There is considerable potential for the effect of inducing further and continuous exports of raw materials, related parts and similar industrial installations. In addition, the latest technology can be transferred to the home country. In the long run, an obvious danger to the exporting country is that as the international product life cycle works its way through, the initial recipients of imports and technology become net exporters. That is, manufactured goods move through the product life cycle from the stages of new product, maturing product to standardised product. As the technologies gained by other advanced countries add to market supply, the demand for the technology exporting country's products will decline. In the post-maturity stage, by which time the product has been standardised, it is then imported into the original technology exporting country, completing the cycle to the obvious detriment of the technology exporting country, i.e. the plant exporting country.

4.2 THE NATURE AND CHARACTERISTICS OF THE CONSTRUCTION INDUSTRY

This section presents the characteristics of the construction industry and the nature of the construction industry and its markets.

4.2.1 THE CHARACTERISTICS OF THE CONSTRUCTION INDUSTRY

Special Characteristics of the Construction Industry

Hillebrandt (1974) defined construction as follows: Construction may be considered as one industry whose total produce is durable buildings and works. It is the contracting part of the industry which undertakes to organise, move and assemble the various materials and component parts so that they form a composite whole of a building or other work.

In his opinion, the construction industry has characteristics which, separately, are shared by other industries, but in combination appear in construction alone, making it worthy of separate treatment. These characteristics fall into four main groups: the physical nature of the product; the structure of the industry and the organisation of the construction process; the determinants of demand; and the method of price determination.

The final product of the construction industry is huge, heavy and expensive. It is required over a wide geographical area and is for the most part made specially to the requirements of each individual client. A large part of the components of the product are manufactured elsewhere by other industries. The nature of the product, together with the structure of the industry it encourages, means that each contract often represents a large proportion of the work of a contractor in any year, causing substantial discontinuities in production functions. The work of the contracting part of industry involves the assembly of a large variety of materials and components with implications for the relative importance of scarce resources.

Demand in the construction industry is for investment goods for which the ultimate use is:

(a) as a means to further production, e.g. factory buildings;

(b) as an addition to or improvement of the infrastructure of the economy, e.g. roads;

(c) as social investment, e.g. hospitals;

(d) as an investment good for direct enjoyment, e.g. housing.

The determinants of the demand for these groups of goods are different and require separate analysis. Moreover, government in some form, either central or local, is responsible for about half the demands on the industry and can affect directly or indirectly almost all the remainder. Together with the investment nature of demand, this preponderance of government influence means that demand tends to fluctuate according to the condition of the economy and the social and economic policies of the government, with consequent effects on the industry.

There is some work, notably private speculative housing but also some commercial and industrial development, where the developer and the contractor are the same firm and hence where there is no obvious price determination for the construction project. The price which the developer charges for the finished product, whether it is a dwelling or office for sale or factory for rent, is influenced by many factors other than the price of construction, such as the price of land, the price of capital and the system of taxation.

Because of the physical nature of the product, the structure of the industry and the characteristics of demand, the method of price determination is usually a separate process for each project and for each piece of work sub-contracted, either by tendering or by some form of negotiation.

The importance of the construction industry in the economy stems from three of its characteristics; firstly, its size, secondly, that it provides predominantly investment goods; and thirdly, that government is the customer for a large part of its work.

Work undertaken by Hillebrandt (1974) shows that the value of the final product of the industry in the United Kingdom, for example, including materials, amounted in 1971 to about £ 5,600 million, or nearly 12 per cent of the gross domestic product, and that net output, i.e. excluding materials and supplies bought from other industries, amounted to 6 per cent of the gross domestic product.

Construction is an investment-goods industry, i.e. the new products which it creates are wanted, not for their own sake, but on account of the goods or services which they can create or help to create. This is obvious in the case of factory building, where the factory is used to produce other commodities. However, it is also true of, say, a school building where the building is not needed for its own sake, but as a place in which it produces education.

In another sense, too, the products of the construction industry are investment or capital goods, for their value is high with regard to the income of the purchaser. For the individual consumer, for instance, the purchase of a house will usually entail the expenditure of several times his annual income. Similarly, the erection of a factory by a producing firm will be a high expenditure with regard to the running costs of production and with regard to the annual income derived from it. As a result, the products of the construction industry, excluding repair and maintenance, are paid for out of capital.

The importance of the public sector as a customer of the industry also has far-reaching effects on the industry and the economy since government has a means of very direct control over the demand on the industry.

These three characteristics-size, investment-goods industry and dependence on government as a customer-provide the key to the interrelationship between the industry and the economy. Size is important since changes in output of the construction industry affect the size of the national product both directly and indirectly, but is also means that what is happening to the construction industry must be a matter of national concern. It is much too large to ignore. As a provider, typically, of about half a country's fixed investment, it is also too important to ignore. That it provides an investment good also means that it is prone to fluctuations in demand, for most of its products will be needed only if certain other factors are favourable, for instance, the expected sales of the goods which the factory would produce; the availability of mortgages for house purchase; and the economic climate in which government takes decisions about the level of social services. For all these reasons, the moment of investment is a matter of choice and will be determined by many factors over which the construction industry has no control. Finally, the dependence on government as a customer means that a government can reduce the demands on the industry by action on its own proposed projects, in addition to that indirect control it can exert on overall investment through control of credit and interest rates.

4.2.2 NATURE OF THE CONSTRUCTION INDUSTRY AND CONSTRUCTION MARKETS

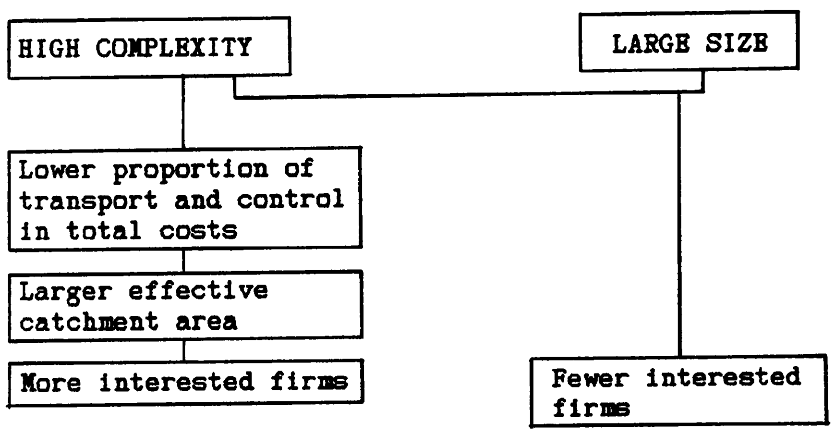
Size of contract is clearly a major determinant of the number of firms who can undertake work. A big contract needs more of all inputs than a small contract, and only some of the total number of contractors in the country have these inputs available to them.

Complexity of contract is another determinant of the potential competitors. A complicated building can be constructed only by firms having control over the technical expertise required. This technical expertise has many components: for instance, the variety and depth of technical skills, and the degree of technology of the materials and processes. It must theoretically be possible to measure the degree of complexity, although the practical difficulties are great. The nearest readily available approximation is probably cost per square metre for building of a given type. Obviously, if complexity and size are combined, the expected proportion of firms within the sub-industry who would in principle be interested in work of that type would be lower.

The idea of complexity would be helpful in understanding the effect of location on the number of firms interested. The reason why firms do not go outside a certain geographical area of operation is that the cost in terms of transport of materials, plant and men become excessive with regard to total costs. However, if the building is very complex, other things being identical, the cost per square metre is likely to be large and the costs of transport goes down in relation to the total costs of the project. Size also has an effect. For small projects, some distance away, it would not be economical to establish a local recruitment office, hostels, etc., because their fixed cost would be too high with regard to the total cost of a project. For large projects, however, the fixed costs could be spread over a large turnover and the existence of a local office for the project would enable the variable costs of transport and control to be considerably decreased. These are of course just two of the factors affecting a contractor's decision on the geographical range of operations.

Consequently, the larger and more complicated the contract, the lower the expected proportion of firms in the sub-industry interested, but this effect is partly offset by the proportion of transport costs of these projects being relatively low, so that the effective catchment area is increased. Diagrammatically, the position is indicated in Figure 4.3. To some extent the relationship between the customer and the firm determine which markets a firm can operate in. A firm growing big may lose customers for small work because they can no longer be sure of having the personal attention of the managing direction, or because they assume that the big firm will charge too high a price on account of its higher overheads.

Figure 4.3 Direct and indirect effects of complexity and size



Source: P.M. Hillebrandt 1974, "Economic Theory and the Construction Industry", pp.27.

The markets in the construction industry should accordingly be defined in terms of the total demand for a particular identifiable service (which is not a close substitute for other services outside this market) or a certain level of complexity and size of contract in a geographical area which may be covered, without undue increases in costs, by firms likely to be capable of undertaking work of that type.

The Challenge of Work Overseas

Hamman (1979) introduced the basic motives which encourage a construction industry company to seek work overseas, and the special problems which it faces in applying good construction management overseas. These special problems may be helpful for the construction companies in case of exporting construction projects.

When the management of a construction company involves itself in securing or in performing work overseas, then that company, whether it is in contracting, consultancy or quantity surveying, is involving itself in international construction. This involvement often takes the form of large, multi-national projects, in which the contractors or the consultants are typically from a Western industrialised country, and the customers are typically from a developing, under-industrialised area (such as the Arab Middle East).

What motivates a construction industry company to seek work overseas? The fundamental motives are:

(1) If the firm's business at home is threatened due to excessive competition or lack of sufficient opportunity.

(2) If the firm has the need to expand, when such expansion can only be abroad. This usually coincides with over-capacity of the firm in its home country.

(3) If the firm sees in overseas work some possibility of higher return on investment than may be possible on the home market.

(4) If, as a defensive way against possible obstacles in the home market, the firm is looking to spread its risks, and overseas work may supply the opportunity for such defensive action.

(5) Other motives, including chance environments: For all the talk about strategy and planning, the actual decision to look

abroad often arises from chance events or coincidence.

The preceding motives may all be seen as extending from the firm's primary motive of survival and long-term profit maximisation.

The principles, procedures and the general managerial aspects that determine the success of a construction business are equal, whether the company operates in one national circumstance or in several: sound planning, expertise, control and vigorous leadership can mean success, whether in Seoul or in Riyadh. Haphazard decisions, professional mediocrity, lack of control and leadership will mean failure, whether in Tokyo or in London.

However, a construction business faces special problems in applying good construction management overseas, such as:

(1) Having to deal with two or more currencies.

(2) Possible problems of remission of capital and profits from the host country.

(3) Having to establish a temporary subsidiary in the host country.

(4) Problems of controlling the foreign subsidiary and communicating with it from the firm's Head Office in the home country.

(5) Problems of expatriation and repatriation of personnel, and of sending and bringing back equipment and plant across legal and commercial barriers (such as problems of visas, permits, customs duties and formalities).

(6) Problems of recruiting suitable technical, administrative and managerial personnel for the international project.

(7) Difficulties and delays in shipping materials, equipment and

plant, which must be brought into the host country from overseas.

(8) Having to compete against, and work with, companies and clients whose nationalities usually differ from that of the firm.

(9) The complication of having to communicate in two or more languages.

(10) Having to operate within the laws and the taxation system of the host country.

(11) The possibility of having to resort to international law, which, in most cases, proves to be exceptionally cumbersome and unsatisfactory.

(12) Complications arising from having to deal with local labour, local bureaucracy, local social attitudes, religious considerations, political or fiscal instability, inadequacy of local services, problems of providing adequate housing, feeding and entertainment, and, the need to work within the local power structure, when this power may be influenced by the interests of influential local families, officials, politicians and middlemen.

The above areas of concern are by no means applicable to any and all developing countries, but they are, nevertheless, areas which cannot be ignored, and which need to be tackled efficiently.

CHAPTER 5

THE CONCEPT OF RISK MANAGEMENT AND CONTRACT STRATEGY IN PLANT AND CONSTRUCTION PROJECTS

In most countries, over the past two decades, international transactions have expanded more rapidly than domestic ones and corporate survival and profits have increasingly come to depend upon how effectively managers cope with international risks.

Large, complex projects for which uncertainty is not properly accommodated are generally more likely to fail in achieving time and cost targets in consequence of unforeseen or unpredictable events. More specifically, greater attention to the whole process of risk management would result in a significant improvement in plant and construction export performance.

The applications of risk management relate to the three major stages of a project, namely, project appraisal and sanction, development of contract strategy and tender preparation. During the contract strategy development stage, the client will be required to focus attention on design, choice of organisational structure, selection of type of contract, means of contractor selection and preparation of tender documents. The client or project manager, therefore, should be expected to devise an appropriate contract strategy for a given project which consistently integrates project characteristics, organisation of design and construction, type of contract and the tendering process.

This chapter will present theoretical concepts of risk management and contract strategy. An empirical survey of risk management and contract strategy will be reported in chapter 10.

5.1 RISK MANAGEMENT

This section on the concept of risk management in the field of plant and construction projects is mainly concerned with financial risk rather than hazard. The three stages of risk management, namely, identification, analysis and response, are discussed. During the three phases of a project proposal (pre-sanction, development of contract strategy, and tender preparation), risk management is especially important and its application, therefore, is also discussed in this context.

5.1.1 INTRODUCTION

Typical uncertainties include delays in obtaining finance and government approval, design changes, geotechnical problems, availability of competent contractors, bad weather, escalation of unit prices and labour rates, transportation problems, and deliveries of equipment and materials. In spite of these known and ever present uncertainties, assessment and control of project risk has been largely neglected in the plant and construction industry, particularly at the inter-face between the client, designer, contractor and sub-contractor.

Large capital projects are not alone in attracting risk and uncertainty. In addition to the size factor, other risk factors include complexity, speed of construction and location of the project.

Many writers have attempted to distinguish between risk and uncertainty. In particular, J.M. Keynes and F.H. Knight drew a sharp distinction between risk and uncertainty, in which risk refers to the chance of the occurrence of some event determined by some objectively verifiable probability distribution, and uncertainty pertains to the chance occurrence of some event where the probability distribution is not known (Herring 1983). However, such a distinction in practical terms has been found to be unhelpful in the management of plant and construction risk management.

Hayes and Perry (1985) offer the following basic concepts of risk management:

(1) Risk and uncertainties are associated with specific events or activities which can be individually identified;

(2) A risk event has a range of possible outcomes each of which has a probability of occurrence;

(3) Some risks, if realised, offer only the prospect of adverse consequences (loss): for example, structural collapse, bankruptcy, war, sea or flood damage. Such events may have a low or high probability but a high impact;

(4) Many common construction risks offer the prospect of either loss or gain: for example, changes in productivity, design changes, inflation. These are typically of high probability and may be of low or high impact;

(5) Because of the individual nature of construction projects there is usually insufficient objective data to calculate the probability of occurrence of specific outcomes of risk events. Thus, some degree of subjective judgement is usually required.

Risks and their effects should be taken into account at all key decision levels throughout the project and by all parties associated with the decision making process.

5.1.2 THE MANAGEMENT OF RISK

It is probably from the insurance industry that we derive the concept of risk management, which is by no means a new field. One approach, suggested by Healy (1981) as being suitable for plant and construction risk management, is as follows:

(1) Risk Identification - identify all risks to the project/contract and provide a preliminary assessment of their consequences;

(2) Risk Analysis - evaluate the consequences associated with specific risk or combinations of risks; and

(3) Risk Response - decide whether the risk can be avoided, transferred or retained. If retained, a decision should be made as to how the risk will be controlled to minimise its eventual consequences (the residual risk).

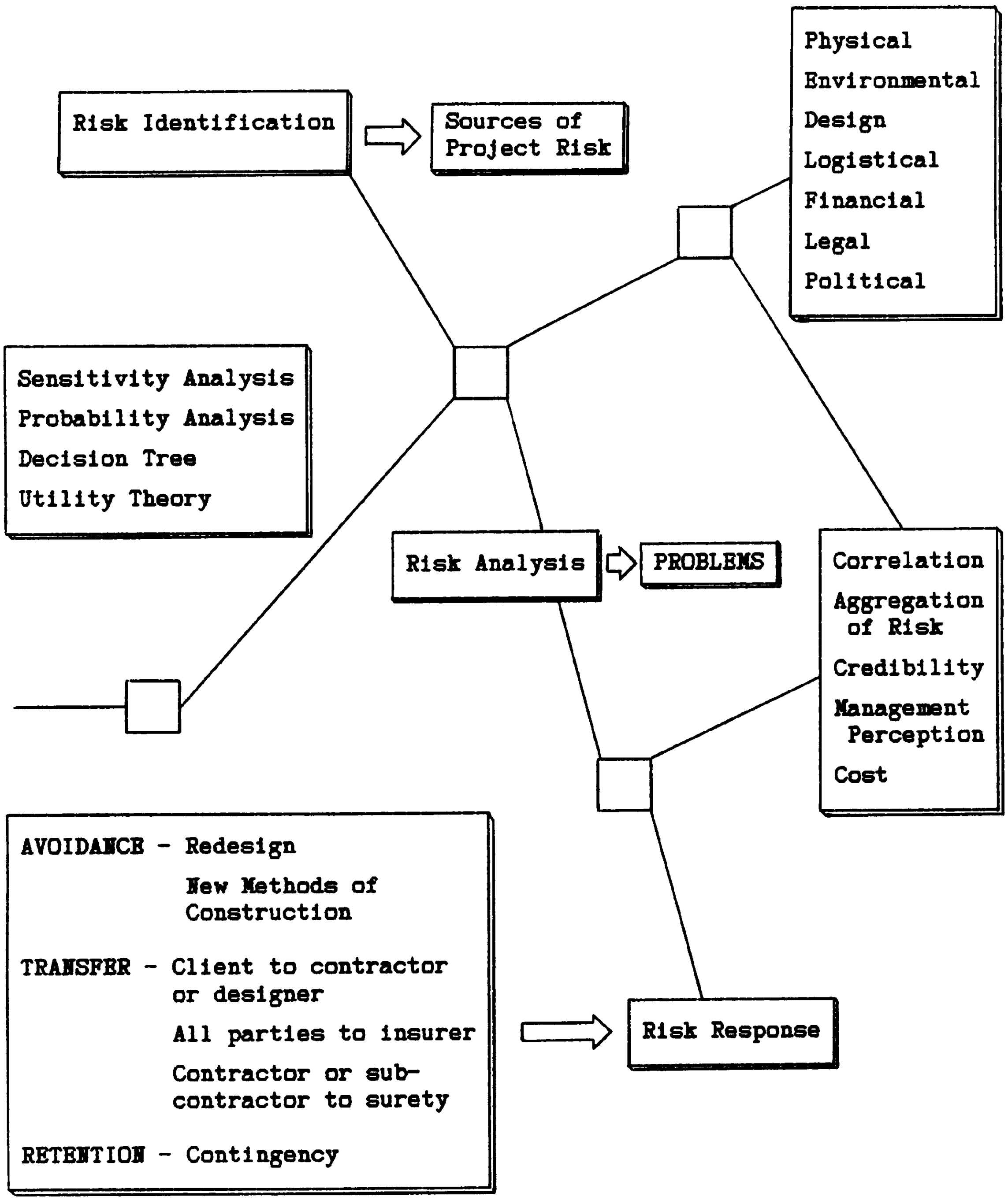
These three stages are briefly discussed below and the overall concept of risk management is summarised in Figure 5.1.

5.1.2.1 RISK IDENTIFICATION

Prior to the analysis of and response to a project or contract, the first stage of the risk management process is the identification and initial assessment of risk. A critical investigation into all the possible events and sequence of events, which may act to the detriment of the project, should be undertaken in the preliminary stages of project assessment. Suitable organisational structure, tendering procedure, type of contract and risk allocation through the contract

Figure 5.1 <u>RISK MANAGEMENT</u>

'The Application of Risk Analysis to the Management of Engineering Construction'



documents can be expressed clearly and exactly on the basis of this identification of risk. Both the risks allocated to the contractor tendering for work and also those inherent in the nature of the work will need to be identified in order to prepare a bid.

5.1.2.2 RISK ANALYSIS

The purpose of risk analysis is to quantify the cost, time or revenue effects of the major risks identified. Such risks can be analysed by measuring their effects on the characteristic or determining features used to estimate project or contract viability (profitability).

The first step is to decide which analytical technique to apply. Risk analysis may begin by using the past experience of the estimator to calculate a range of costs and times for line items and task durations. Single value estimates are intrinsically uncertain and the programmes and cost estimates are frequently seen to be over-optimistic. For example, Feiler(1983) recalls that over 20 years ago the Rand Corporation proved that using single-value activity durations produced schedules that were 10 to 50% optimistic.

Inyang(1983) and Porter(1981) have suggested a) that it is usually not a good idea to analyse in detail every specific risk and b) that it is not necessary to consider those risks too small to make much impact on the total of the larger risks already identified.

5.1.2.3 RISK RESPONSE

Risk response can be considered in terms of avoidance (reduction), transfer or retention.

Avoidance or Reduction

In the extreme case, the project is reappraised or even replaced by an alternative due to the serious consequences of risks. Such a course of action should be determined at the project appraisal stage. However, if projects are inadequately appraised before sanction, hard decisions may have to be made at the contract stage when risk may be avoided or reduced by redesign, different packaging of the work content or different methods of construction.

The avoidance of risk is an essential element in the strategy of foreign investors. The decision to invest is usually motivated by a desire to reduce risks of various sorts. Risk avoidance also has an influence on the form of the investment. International risk can be avoided or reducd by direct investment, namely by establishing a foreign subsidiary, joint-ventures (consortia of foreigners, joint-ventures with local firms and state-owned enterprises in a host country), licensing agreements with independent producers in foreign countries, and even the use of special payments, often a euphemism for bribes, as a risk-insuring device.

Transfer

Hayes and Perry (1985) suggested that the four most common channels for the transfer of risk in construction projects and contracts are as follows: (a) client to contractor or designer; (b) contractor to sub-contractor; (c) client, contractor, sub-contractor or designer to insurer; and (d) contractor or sub-contractor to surety.

One important characteristic of the transfer response is that someone other than the client shares or totally absorbs the responsibility for the consequences of risks should they occur. Therefore, the responsibility lies with the client for initiating this form of risk response should it be in its own best interests to transfer the risk for which it could expect to pay a premium. Perry (1985) suggested that the following factors impinge on the transfer response:

(a) which party can best control the events which may lead to the risk occurring;

(b) which party can best control the risk if it occurs;

(c) whether or not it is preferable for the client to retain an involvement in the control of the risk;

(d) which party should carry the risk if it cannot be controlled;

(e) whether the premium to be charged by the transferee is likely to be reasonable and acceptable;

(f) whether the transferee is likely to be able to sustain the consequences if the risk occurs; and

(g) whether, if the risk is transferred, it leads to the possibility of risks of a different nature being transferred back to the client.

The mechanisms for transfering risk will be carried out either through an insurance policy or through the Conditions of Contract.

Retention

Risks retained may be controllable or uncontrollable. Where control is possible, it may reduce the possibility of occurrence of a risk event and may also minimise the effect should the event occur. In either case there is still a residual risk, and it is usual in plant and construction projects for there to be a contingency fund in this situation.

Contingency sums are used to absorb extra cost or to assist in overcoming delay. Yeo (1982) and Inyang (1983), in an attempt to define the required contingency fund more precisely, applied risk analysis techniques to the establishment and management of a contingency fund. A probabilistic approach to cost estimates is suggested which gives a range of estimates, rather than a single value, which allows a target cost to be selected within this range that agrees with the degrees of risk acceptable to the client and contractor. Choosing the zero-risk option is likely to result in a maximum bid, while a lesser figure involves some risk of cost overrun.

5.1.3 RISK ANALYSIS TECHNIQUES

The measurement of risk can be achieved by a number of techniques with varying degrees of sophistication and limitations. Theoretical techniques of risk analysis have been available for many years, but their actual application on plant and construction projects has been restricted and confined mainly to large clients and a few specialist or large consultants.

SENSITIVITY ANALYSIS

Sensitivity analysis, the simplest form of risk analysis, is one of the most commonly known non-probabilistic techniques for risk appraisal.

Definition of a likely range of variation for each particular part of the original base case estimate will show risk and uncertainty factors. Those variables which have a high impact on cost, time or economic return and to which the project will be most sensitive are the only ones for which, in practice, such an analysis is performed. The effect of change in each of these variables on the final cost or time criteria is then appraised in turn across the assumed ranges.

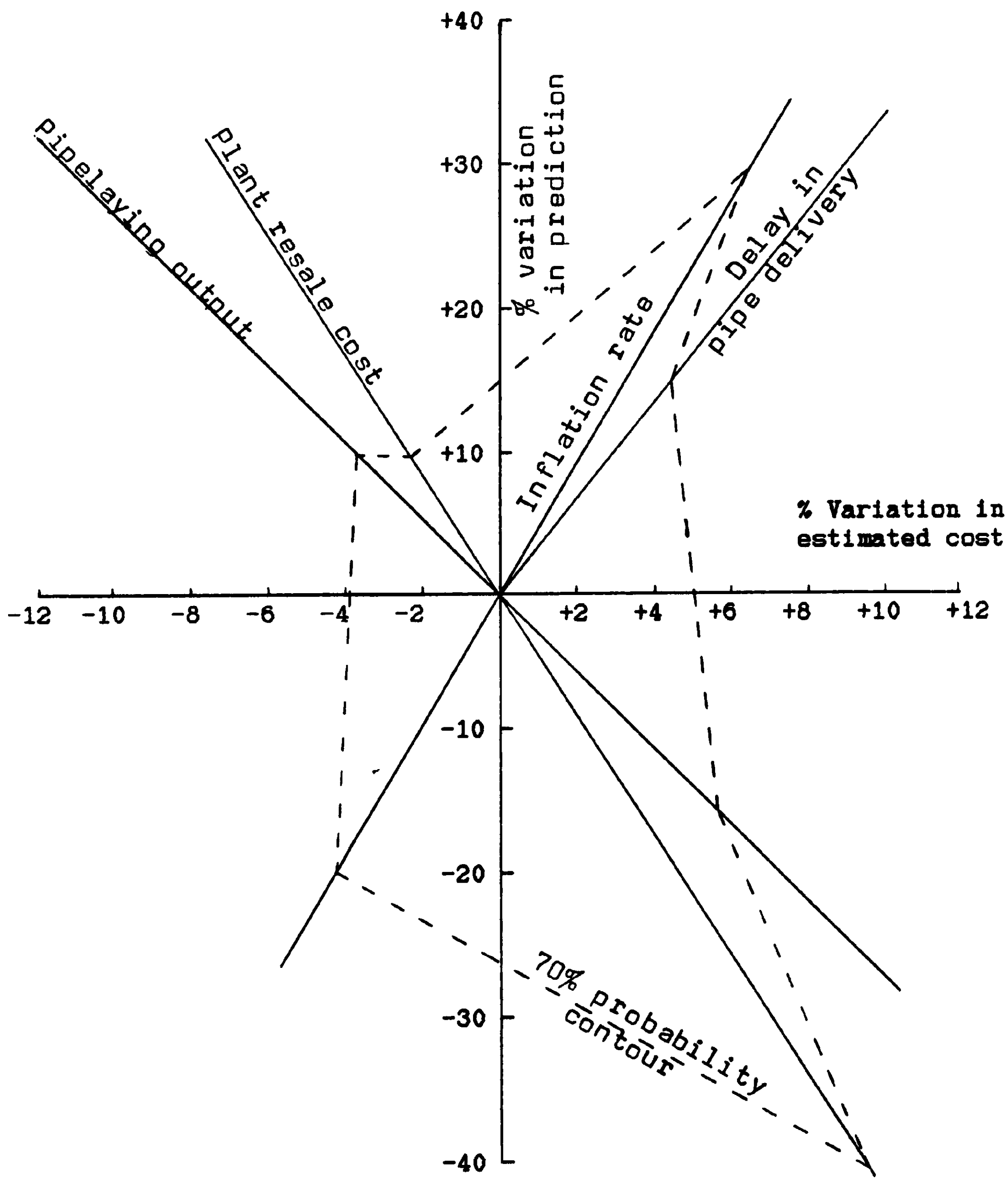
Because the variables of sensitivity analysis are treated individually, the sensitivity analysis diagram or model gives no indication of the anticipated probability of occurrence of any event, but this can be partially overcome by the use of probability contours. Figure 5.2 shows the four major cost uncertainties and the effect on total cost of a change in their estimated value. The probability contour indicates the estimator's subjective view that there is a 70% probability of values falling inside the contour. Thompson(1981) has suggested that the main benefit of adding the probability contours to the sensitivity diagram is to help the estimator to focus his attention on the more sensitive areas. A normal probability distribution can be applied across each variable to overcome an inability to present a probability distribution of predicted outcomes for any risk.

PROBABILITY ANALYSIS

Probability analysis, a more sophisticated form of risk analysis, overcomes the limitations of sensitivity analysis by showing a probability distribution for each variable and then taking into account situations where any or all of these variables can change their initial values simultaneously.

It may be difficult to define the probability of occurrence of any

Figure 5.2 Sensitivity Diagram with Probability Contours
Risk Factors: Overseas Pipeline Contract



Source: Thompson, P.A. (1981), Organisation and Economics of Construction, McGraw-Hill, London, pp. 48-49.

specific value of a variable. Every project has many peculiar features and the general environment within which a project develops tends to change quickly. However, it has proved possible to make tentative estimates of probability distributions and ranges.

The range of variation is also a subjective judgement as with sensitivity analysis. Because of its predictive ability and its consequent aid to managers in decision making, probability analysis has had some considerable successes.

THE MONTE CARLO SIMULATION

Monte Carlo simulation, an approach which reconstructs probability distributions based on the selection or generation of random numbers, provides an extremely powerful yet conceptually simple method of incorporating probabilistic data.

Bundick, Mojena and Vollmann(1977) have explained the fundamentals of Monte Carlo simulation in detail by applying the approach to emergency room arrivals. Recent research by Yeo(1982) and Inyang(1983) has also explained the concept of risk management using the Monte Carlo method, with Yeo observing that such simulation requires a deterministic model, assesesments of probability distribution and a random number generator.

DECISION TREE ANALYSIS

Decision trees appear to offer potential for use in defining the appropriate number and nature of contract packages to minimise risk. Many different routes may be followed to reach the goal in major projects. The decision maker is faced with an array of investment possibilities and a sequence of decision choices before considering the project in detail and developing any network analysis. The decision tree which indicates the present possible courses of action and all future possibilities is a graphical method of compiling the information.

The decision maker places some degree of probability on an outcome occurring. Future outcomes are considered, the possibility of failure is quantified, and some value is placed on each decision. This form of risk analysis is usually applied to cost considerations.

UTILITY THEORY

Utility theory provides an attractive means by which to describe the subjective preferences of decision makers in environments characterised by risk. Utility theory is a good and sound theoretical technique, but not easily applied within the plant and construction industry.

Inyang (1983) suggested that, until a more suitable approach is derived, utility theory offers the best way of quantitatively defining attitudes to risk.

MANAGEMENT PERCEPTIONS

Managers' understanding of and confidence in both the techniques and results influence their likely attitude towards risk analysis. Some managers have little knowledge of the relevant mathematics and in consequence are wary of using such analysis.

With careful thought and application some of the obvious problems might be solved, although other difficulties require further research and development. However, management's attitude to risk itself is one of the most difficult problems to resolve. Management needs to select between different solutions identifying different levels of risk. Sometimes the best choice of technique is obvious, but on other occasions the output data raises further questions centered on management's willingness to accept or reject risk.

It is preferable for decision makers to face these difficulties rather than ignore risk and uncertainty, but it must be recognised that this will create a new challenge to many managers.

5.1.4 APPLICATION OF RISK MANAGEMENT

The applications relate to the three major phases of a project in which the concept of risk management can be fully applied. These three phases are project appraisal and sanction, development of contract strategy and tender preparation.

PROJECT APPRAISAL AND SANCTION

The greatest level of uncertainty about the future appears in the appraisal phase of a new project. The largest influence on final cost results from decisions taken at this phase. The extent and effects of change which is inevitable in major capital projects are frequently under-estimated during this stage.

A realistic prediction of the factors having an influence on the design, construction and operating phase is indispensable. Hayes and Perry (1985) suggested that during this phase the main risk-related decisions or actions for the client include the following:

(a) identification of all project risks. Table 5.1 gives the main sources of risk which may be found on any project. It is recommended that each of these primary sources be thoroughly considered on each project to produce a comprehensive list of risks specific to the project or contract;

(b) quantification of each risk in terms of time and cost where possible;

(c) assessment of the relative influence and probability of each risk;

(d) identification of the most serious risks for consideration by project management;

(e) allocation of these risks to various parties and the establishment of contingency funds to protect the client against those unavoidable risks which are to be retained.

At an earlier period in the decision process the client should identify the most serious risks which affect the achievement of the most important project objectives. Therefore, some agreement on the ranking of these objectives must be achieved.

DEVELOPMENT OF CONTRACT STRATEGY

During this stage the client will focus his attention on design, selection of organisational structure, choice of type of contract, methods of contractor choice, and preparation of tender documents. The objective is to select a suitable contract strategy for the project. The primary vehicle for the allocation of risks is the Conditions of Contract.

Hayes and Perry(1985) also suggested that during this stage the main risk-related decisions or actions for the client include as follows:

(a) identification and analysis of all construction and contract risks;

(b) definition of the principles which will govern the allocation of

TABLE 5.1

PRIMARY SOURCES OF RISK IN PROJECTS

Types of Risk	Primary Sources
Physical	Loss or damage by fire, earthquake, flood, accident, landslip, etc.
Environmental	Ecological damage, pollution, waste treatment, etc. Public enquiry
Design	New technology, innovative applications, reliability, safety Detail, precision and appropriateness of specifications Likelihood of change Interaction of design with method of construction
Logistics	Loss or damage in the transportation of materials and equipment Availability of specialised resources - expertise, designers, contractors, suppliers, plant, scarce construction skills, materials, etc. Access and communications Organisational interfaces
Financial	Availability of funds, adequacy of insurance Adequate provision of cash flow Losses due to default of contractors, suppliers Exchange rate fluctuations, inflation Taxation
Legal	Liability for acts of others, direct liabilities Local law, legal differences between home country and home countries of suppliers, contractors, designers
Political	Political risks in countries of owner and suppliers, contractors - war, revolution, changes in law
Construction	Feasibility of construction methods, safety Industrial relations Extent of change Climate Quality and availability of management and supervision
Operational	Fluctuations in market demand for product or service Maintenance needs Fitness for purpose Safety of operation

Source: Hayes R.W. and Perry J.G. Risk and Its Management in Construction Projects. Proc. Institution of Civil Engineers, Part 1, Vol. 78, June 1985, pp. 512.

risks;

(c) selection of the organisational structure and type of contract which is best suited to the management of the specific project and contract risks, whilst taking account of other constraints or factors which influence this choice; and

(d) allocation of the risks to the parties through the contract documents.

Table 5.2 shows the main sources of risks for overseas construction contracts. Some of the risks given in Table 5.2 may be immediately disregarded for contracts based in the home country. Overseas contracts are usually exposed to a more extensive range of risks than home based contracts. Furthermore, there is a greater possibility and influence of risks arising overseas. Therefore, the avoidance of ambiguity and the clear definition of risk allocation are particularly important for drafters of contract documents.

Extensive research has been done on the principles of risk allocation in contracts by Porter (1981), Barnes (1983) and Inyang (1983). In particular, Barnes included a practical risk-allocation algorithm.

TENDER PREPARATION

The most important risk management tasks for the contractor during tender preparation are as follows:

(a) appraise the influence of the individual risks;

(b) determine which risks can be transferred to sub-contractor, supplier or insurer (or back to the client by exploiting the loopholes in the conditions of contract);

(c) set up management controls for those risks which must be retained by

TABLE 5.2

RISKS WHICH INFLUENCE CONTRACT STRATEGY ON OVERSEAS CONSTRUCTION CONTRACTS

Types of Risk	Primary Source
	Incomplete design
	Inadequate site investigation
Technical	Uncertainty over the source and availability of materials
	Advanced/new technology
	Need for standardisation of suppliers
	Inflation
	Availability of and fluctuation in foreign exchange
Financial	Delay in payment
	Repatriation of funds
	Local taxes and royalties
	Creditworthiness of contractors
	War or revolution
Political	Constraints on the availability and employment of expatriate staff
	Customs and import restrictions and procedures
	Insistence on use of local firms and agents
	Regional differences in regulations
	Embargo
Logistical	Availability of resources - particularly construction plant, spare parts, fuel and labour - materials and expertise
	Uncertain productivity of resources/inappropriate plant
	Weather and seasonal implications
Construction	Industrial relations
	New or different methods of construction
	Suitability of materials

Source: Hayes R.W. and Perry J.G. Risk and Its Management in Construction Projects. Proc. Institution of Civil Engineers, Part 1, Vol. 78, June 1985, pp. 517.

the contractor; and

(d) estimate the amount of risk contingency fund to be included in the tender sum.

Risk at this stage for the contractor results not only from the allocation of risk by the client, but also from the tendering process itself. For instance, errors in appraising productivity or a lack of understanding of the contract documentation can give rise to new risks which must be considered.

5.2 CONTRACT STRATEGY

This section presents the concept of contract strategy within the context of plant and construction projects. The essential decisions for devising a contract strategy mainly focus on: a) the project characteristics; b) the organisational system for design and construction; c) the type of contract; and d) the tendering process. But only the organisational system for design and construction and the type of contract will be discussed in detail in this section

5.2.1 INTRODUCTION

"Contract strategy" is a term used here to depict policies for the organisation of design and construction and for the selection of appropriate contractual arrangements for the performance of a specific project.

An important task of the client or his project manager is to develop a contract strategy which involves a thorough survey of the options available for the implementation and management of design and construction. From a set of interrelated decisions the purpose is to maximise the probability of achieving key project objectives. The selected strategy is likely to be at its best if it can overcome a variety of constraints and be well enough designed to withstand the uncertainty and risk connected with the project.

The decisions taken during the development of a contract strategy determine the responsibilities of the parties, the control of design, construction and commissioning and the co-ordination of the parties. These decisions allocate risk and define policies for risk management and they define the degree and range of control transferred to contractors. Thus, they influence cost, time and quality.

5.2.2 ESSENTIAL DECISIONS FOR CONTRACT STRATEGY

The development of a contract strategy is initiated by identifying the areas which compose the strategic choices described above. Each of these areas may be regarded as distinctive and interactive. The contract strategy which demonstrates a consistent integration of the choices across each of these strategic areas is the most favourable.

The choices capable of being used are described and estimated in subsequent sub-sections. The most important decision areas, adapted from Perry (1985), are briefly introduced below:

Project Characteristics

(a) Identification and ranking of primary objectives associated with cost, time, and functional performance.

(b) Assessment of the difference between primary objectives and establishment of tolerance limits for at least one of them.

(c) Identification and ranking of secondary objectives.

(d) Identification of project confinements, including priorities of timing and phasing.

(e) Identification of project risks.

<u>Organisation of Design and Construction</u>

(a) Choice of suitable size and scope of contract work packages.

(b) Selection of suitable design organisation from, and allocation of design and supervision responsibilities to, client, consultants and contractors.

(c) Choice of appropriate contractual arrangement if contractor is involved in design.

<u>Type of Contract</u>

(a) Choice of suitable type of contract from lump sum, admeasurement, target cost or cost-reimbursable.

(b) Choice of suitable vehicles for measurement of work and assessment of payment.

<u>Tendering Process</u>

(a) Selection of ways of appointing design consultants/contractors.

(b) Selection of ways of appointing construction contractors/suppliers.

(c) Decision on whether pre-qualification is needed.

(d) Preparation of tender analysis.

(e) Selection of appropriate conditions of contract, evaluation of suitable provisions and alterations to model forms, if used.

5.2.2.1 ORGANISATIONAL STRUCTURES FOR DESIGN AND CONSTRUCTION

Introduction

Many choices are available to the client and his project manager for the management and performance of design and construction. In this respect, most projects make use of the services of external organisations to assume these special activities.

Some organisational structures are closely connected with a specific type of contract. For example, the conventional approach is closely linked with an admeasurement contract and fee contracting with construction on a cost-reimbursable basis.

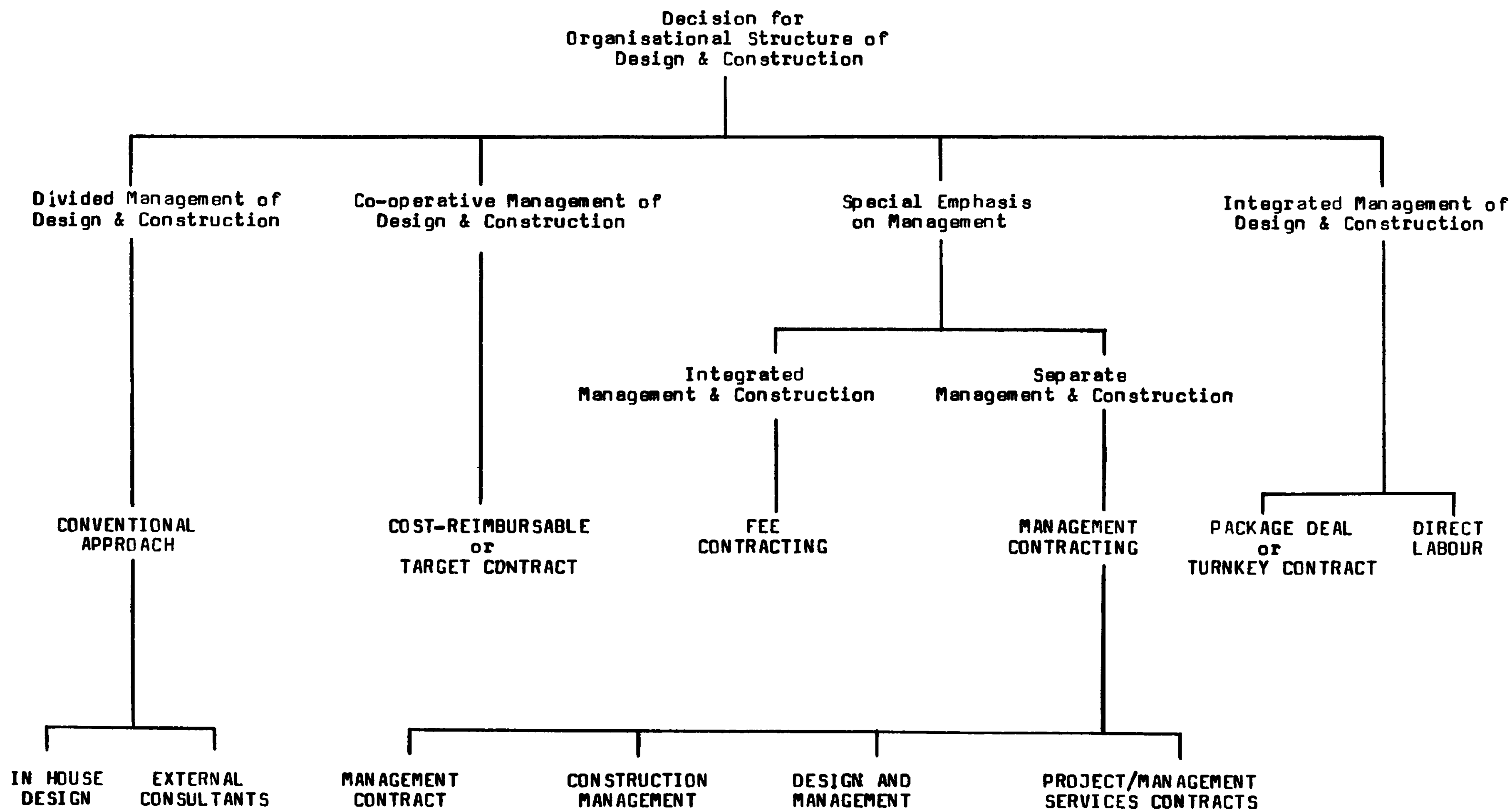
Figure 5.3 displays the main organisational selections. It may be applicable to explain overall plant and construction industry.

Some guidance for the organisational structure of design and construction can be found in a report concerned with the methods of organising projects analysed through the case studies by NEDO (National Economic Development Office, 1983).

Factors Influencing Selection

The logical choice of an organisational structure requires the selection of an approach most suitable to the project characteristics (such as objectives, constraints and risks). Perry(1985) suggested that this choice, facilitated by disaggregating the overall decision into several subsidiary and interrelated decisions, covers the following:

FIGURE: 5.3 CHOICES AVAILABLE TO PROJECT MANAGEMENT FOR THE ORGANISATIONAL STRUCTURE OF DESIGN AND CONSTRUCTION



Source: Perry. J. G (1985), Contract Strategy in Construction Project Management, Ph.D. Thesis, UMIST, pp. 62

(a) the size and nature of the work packages within the project;

(b) the appropriate number of design teams to suit the nature of the work;

(c) the selection of the design teams from in-house resources, external consultants or contractors (or some combination of these);

(d) the method of management and co-ordination of design teams;

(e) the extent to which construction is to be separated from or integrated with design;

(f) the procedure for managing the design/construction interface;

(g) the process for supervision of construction;

(h) the benefits or restrictions upon using a combination of organisational structures within the projects;

(i) the extent to which political, social or economic factors are dominant, for example in relation to the use of direct labour, labour-intensive construction and organisations of certain nationality;

(j) the resources and expertise which the client is able, or wishes, to commit to the project.

The definition of an overall policy by the project manager should be based on an initial evaluation of the subsidiary decisions as shown above. Such a policy will then need to be engaged with the organisational structures supplied by the plant and construction industry.

The Conventional Approach

The consulting engineer has a particularly important position since he has charge of the design, the engineer for supervision of construction and administration of the construction contract, and the contractor for construction.

The conventional approach is usually concerned with an admeasurement contract or, at times, a lump sum contract. A number of parties share in the management of both the design and construction. The range of the client's involvement in management and construction and that of contractor's input to the design of the permanent works are both restricted.

The conventional approach has been used broadly and successfully in many countries. It has two main advantages:

(a) An unbroken involvement by a consulting engineer, including administration of the construction contract, is possible from the feasibility phase to completion of construction;

(b) The client is advised on project estimation, execution and financing by the consulting engineer who establishes contacts with government and other authorities.

Some of the disadvantages of this conventional approach may be supplemented by hiring an experienced consulting engineer to give advice on the appropriate terms of reference and to liaise on decisions with the authorities.

Target and Cost-Reimbursable Contracts

Their use gives rise to a contractual relationship and environment which is significantly different from the conventional approach. Target cost contracts indicate a best estimate of the cost of the work to be performed. During the construction stage of the project the initial target cost will be changed by consent between the client or his designated representative and the contractor to allow for any alterations to the primary specification. The parties of the contract share the savings between target and actual costs at the end of the contract. The incentive to both client and contractor to cooperate effectively to this end is the main attraction of this form of contract. However, successful implementation depends on the fulfilment by both parties of a number of conditions, such as mutual confidence and a clear understanding of the principles, the roles and relationships.

The client pays the actual cost incurred in both target and cost-reimbursable contracts. As a rule, these contracts are appropriate to any project where:

(a) The client wishes to participate actively in the management and execution of the contract and to train his own staff;

(b) There is a high level of concern for risks or organisation and technical complication and hence a requirement for flexibility, including design change, for example in projects such as power stations, tunnels and dams; and

(c) An early start to construction is required.

Extensive research has been done on target cost contracts by NEDO (1982), on cost-reimbursable contracts by Marsh (1981) and on target and cost-reimbursable contracts by Perry and Thompson (1975).

Fee Contracting

In a fee contract, one firm under one contract is responsible for both the construction and the management. The costs of management services, overheads and profit margin are included in a fee based on the estimated amount (ie value) of the work, although construction is reimbursed at actual cost. Therefore, a fee contract is fundamentally "either a type of conventional or cost reimbursable contract with special emphasis on management services".

The use of designers and quantity surveyors selected by the client tends to give him greater control over this contract than a package deal or turnkey contract. The fee contractor should be designated early in the design phase in order to get the maximum benefit.

The Wood report (1975) suggested that a fee contract was applicable to any project where:

(a) The full extent and nature of the work will not be known until after commencement;

(b) The contractor can contribute to the design phase;

(c) Time is of importance and design and construction phases overlap.

The report went on to recommend the approach as the most appropriate for emergency, imminent work and making changes etc.

Management Contracting

A report by Slack and Giles (1981) defines the management contract as:

> "....... a means whereby the repesctive skills and reponsibilities of the parties concerned in the creation of a project are provided with the framework to operate in the most effective way to the benefit of the employer".

Management contracting is an arrangement where the client designates an external organisation (management contractor) to manage and co-ordinate construction stages of a project. The management contractor does not usually carry out any of the construction work at site, but instead it may supply a management team to control and co-ordinate all site activities. Other construction contractors take responsibility for the construction work at site, under a chain of contracts with the client, or sub-contracts with the management contractor.

The essential advantages of management contracting can be seen in terms of flexibility for overlapping design with construction and in introducing design changes. Further benefits result from the input of a contractor's experience into the client's management and design teams. However, disadvantages have also been indicated with regard to the allocation of risks, the responsibilities of the parties and ability of the management contractor to have an effective design input.

The use of management contracting is suitable for large and complex projects when:

(a) An early start to construction or an overall time saving is needed;

(b) There is a need for flexibility (particularly with reference to design change and the co-ordination of multi-contractors);

(c) The design and specification stages cannot all be finished before work starts on site, so that they overlap with construction;

(d) The management problems of the project need special attention.

Hayes, Perry and Thompson (1983) have extensively explained the management contract in CIRIA (Construction Industry Research and Information Association) Report 100, which was based on visits to 52 firms and organisations in the U.K. and USA. They have concluded the use of management contracting in the U.K. is mainly pertinent to the building and process plant industries. However, Slack and Giles (1981) have concluded that the management contract is particularly suitable to civil engineering projects.

Turnkey/Package Deal Contracts

Even if partial designs may be sub-contracted to specialist consultants, both detailed design and construction are assumed by one organisation in the turnkey or package deal contract. Therefore, the management of design and construction is put together within this organisation. In general, payment is on a lump sum basis, although this is frequently divided into elements of work stages. Payment is normally phased.

Since success depends largely on the client's stating his objectives, specifications and requirements comprehensively, a clear and full specification should be arranged before the contract is placed.

The principal merits of this approach are that the client deals with only a single organisation which can produce an efficient construction design and can save time by overlapping the design with construction. Its disadvantages include the need for the client to involve himself in the whole package at an early phase and at that time to be able to clearly delineate his requirements. The client is apt to lose control of detail and is in a comparatively weak situation in which to negotiate the price to be paid for change after the contract award.

The turnkey or package deal contract is suitable for work of a standard or repetitive nature when:

(a) Contractors supply specialist design or construction expertise for a specific type of work;

(b) Design is strongly affected by the method of construction;

(c) The client wants to commit the minimum of management resources for the project; and

(d) There is a need for a prompt start to construction or for a comprehensive time saving.

<u>Direct Labour/Force Account</u>

A few clients directly hire their own permanent labour force and construction management personnel, which is known as direct labour in the U.K. and as a 'force account' in other countries.

Accordingly the client could serve as both client and package deal contractor. Although the client subcontracts design to external consultants responsibility for the management of design and construction still lies finally within the client's project management.

5.2.2.2 TYPES OF CONTRACT

INTRODUCTION

This sub-section is associated with the choice of type of contract for employing those external firms required by the client under the various organisational structures presented in the previous sub-section.

Selecting the type of contract is one of the most important strategic decisions. In the plant and construction industry the types of contract, which usually refer to the document including the Conditions of Contract, are virtually classified by their payment systems. It is generally possible to bring four main types of contract (lump sum, admeasurement, cost-reimbursable and target cost) together into two distinct classes, as suggested by Perry (1985):

(a) PRICE-BASED - lump sum and admeasurement. Prices or rates which include all costs, overheads, risk contingencies and profit are submitted by the contractor in his tender.

(b) COST-BASED - cost-reimbursable and target cost. The actual costs incurred by the contractor are reimbursed, together with a fee for overheads and profit.

CHOICE OF CONTRACT TYPE

The suitableness of the provisions for incentives, flexibility and risk allocation should be considered early in the contract strategy review. This helps get rid of misconceptions about the most important choice of type of contract. Perry (1985) suggested that any contract should include the following three essential requirements:

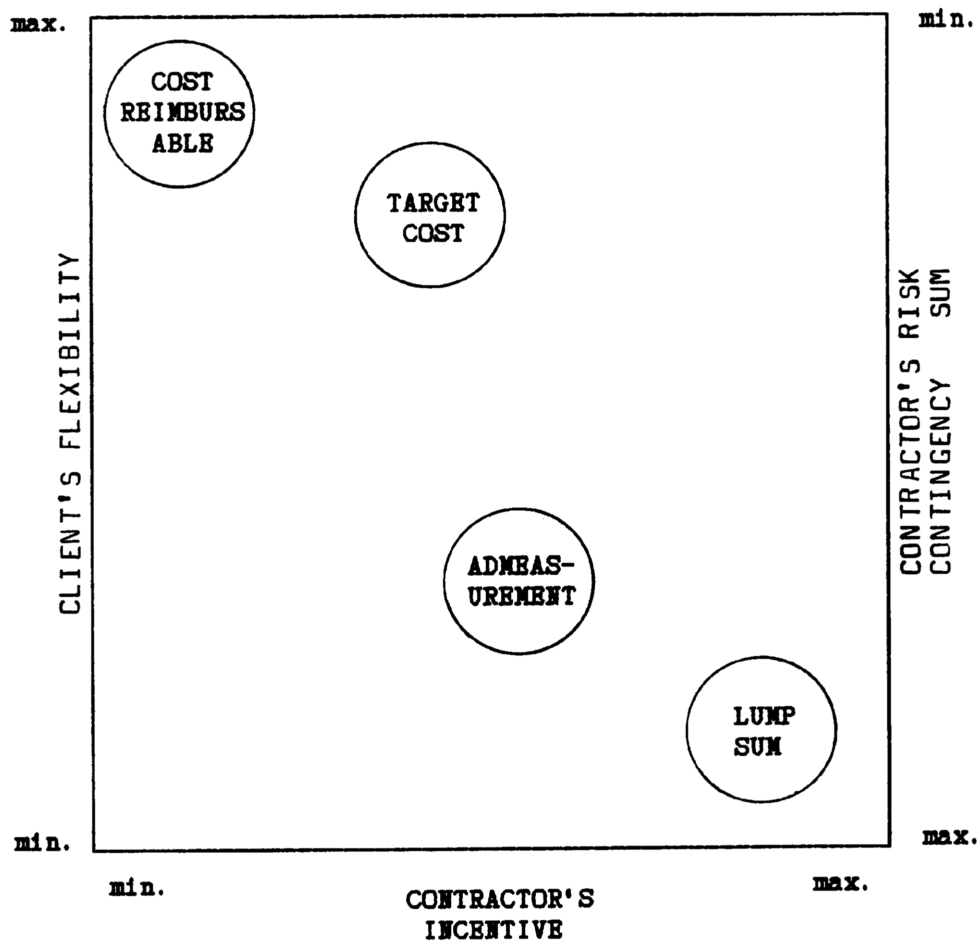
(a) Incentive - the prime purpose is to provide an adequate incentive for efficient achievement by the contractor. This must be reflected in incentives for the client to provide suitable information and support in a timely manner.

(b) Flexibility - the prime aim is to provide the client with sufficient flexibility to introduce change which may be expected but not defined at the tender stage. An essential requirement is that the client should prepare reasonable assessment of such changes.

(c) Risk sharing - the prime aim is to share all risks between client and contractor. The contractor will introduce a risk contingency sum in his tender as protection against the risks he must carry.

Figure 5.4 demonstrates the inter-relationship of these requirements with the type of contract. The requirements are represented in terms of contractor's incentive and risk contingency and client's flexibility. It is obvious that, in general, contractor's incentive and client's flexibility tend to be incompatible. For instance, a cost-reimbursable plus percentage fee contract imposes a high level of flexibility permitting extensive change on the client, but also implies minimum

Figure 5.4 CHARACTERISTICS OF DIFFERENT TYPES OF CONSTRUCTION CONTRACT.



Source: Perry, J.G. (1985), Contract Strategy in Construction Project Management, Ph.D. Thesis, UMIST, pp. 81.

financial incentive for the contractor to perform efficiently. The converse is true at the other extreme of a lump sum contract. However, it should be noted that the target cost contract suggests greater flexibility than the admeasurement contract whilst supplying a similar degree of incentive.

There are many detailed points of difference between the types of contract. Those of most importance to the client in making a suitable choice for contract strategy decision making are summarised in Table 5.3 (found at the end of this section) originating from Perry (1985).

LUMP SUM CONTRACT

A lump sum contract is based on a single tendered price for the whole works. It implies that the design is finished at the tender phase. That is to say, the client should avoid or at least minimise design changes during construction.

In a lump sum contract the contractor carries all risk, although it could be argued that he may have taken the effect of all the possible risk into consideration when he computed his lump sum. This could be to the client's disadvantage in that he may have paid an unnecessarily high premium for a risk he was not prepared to carry.

Competitive tender is usually the process by which lump sum contracts are let. Thus, those who most seriously underestimate the risks , all other things being equal , are likely to be the lowest bidders. The ability of the contractor to reduce costs by planning the most efficient use of resources and exercising good control enables him to maximise his profit.

Change or disruption initiated by the client may cause the contractor to claim for additional payment or time. Therefore, lump sum does not necessarily imply a fixed price - price may be adjusted for cost escalation. Payment may be phased at intervals or related to achieved work results.

The use of lump sum contracts is suitable for any project when:

(a) Design is finished at tender and minimal change or no change is expected;

(b) There is a high degree of tender competition for a well-defined contract package;

(c) The client wants to abdicate all or most of the risks to the contractor;

(d) The degree of risk is low and quantifiable;

(e) The client involved in contract administration wants to minimise resources.

ADMEASUREMENT CONTRACT

An admeasurement contract is based on Bills of Quantities or Schedules of Rates. Items of work are detailed in quantities. Then, rates against each item are tendered by contractors. A peculiar characteristic of admeasurement contracts is that they allow for variation and change during the period of construction. Therefore, diverse clauses enabling payment and the contract period to be adjusted accordingly are included in the conditions of contract.

In an admeasurement contract the design needs not be complete at the tender phase and, in reality, the client can overlap design with construction. It can be perceived that there are limits to the degree of change which this type of contract can accommodate without heavy burden.

The final price in an admeasurement contract is always different from the tender price. This unavoidable consequence stems from re-measurement, change, variation and delay. Thus, when there is a major disruption a strong possibility of drawn-out disputes over claims is involved and the solution of the contract price may be delayed for several years. Payment is normally monthly and is based on measuring quantities of finished work and making a valuation at rates in the tender or from new rates negotiated from tender rates.

Like lump sum, the admeasurement contract is usually let by competitive tender, but estimation is normally more complex than for lump sum because a greater amount of data is supplied by the contractor. A realistic estimate, by the client or his consultant, is necessary before tender estimation takes place, which can then be used to examine the validity of the bids.

The use of admeasurement contracts is suitable for any project when:

(a) Design is finished but changes in quantity are anticipated;

(b) Design and construction need to be overlapped but enough design work has been finished to prepare a correctly itemised bill of quantities;

(c) Little or no change to programme is anticipated;

(d) There is a low and quantifiable level of risk.

COST-REIMBURSABLE CONTRACT

A cost-reimbursable contract is based on payment of actual cost plus a specified fee for overheads and profit. The contractor's cost accounts are open to the client (Open Book Accounting). The client carries all risk since he has to pay for all actual cost of construction.

Thus, there is no direct financial incentive for the contractor to mitigate the risk or improve his efficiency.

In a cost-reimbursable contract the contractor can be involved early in the design process either to contribute to design or to make an early start to construction. In either case closer co-operation between client and contractor than a price based contract is required.

The final price is partly dependent on the efficiency of the contractor and on the extent to which risks materialise. The cost based contracts are the most appropriate for high risk contracts. The co-operative effort which furnishes the best opportunity to manage and control risks is supplied by these cost based contracts. Thus, the client pays only for the risks which actually happen. Accordingly, the gamble factor does not apply to both parties. The certainty of the final price cannot be reached before all work is finished. However, improved forecasting of the final outcome is possible through openbook accounting and joint planning when work is in progress.

Cost-reimbursable contracts have been let by competitive tender but the degree of financial competition is definitely limited to the fee. In general, clients prefer to negotiate with a single reputable and reliable contractor with whom they have contact.

The use of this type of contract seems suitable for any project when:

(a) There is an insufficient definition of the work at the time of tender due to emphasis on early completion and an expectation of great change in work content;

(b) The work is exceptionally complicated in its organisation, for example the multi-contract situation;

(c) Design input from the contractor is advisable;

(d) The work is involved in technical innovation or complexity;

(e) There is involvement, by the client, in the management of the project or in industrial relations;

(f) There is some recurrent work.

TARGET COST CONTRACT

Target cost contract is based on the setting of a probable (or target) cost for the work. Major alterations in the work and cost inflation result in the subsequent adjustment of the target cost. This type of contract cures the main weakness of a pure cost-reimbursable contract by imposing an incentive on the contractor to work efficiently.

The contractor's actual costs are monitored and reimbursed as in a cost-reimbursable contract. Any difference between actual cost and target cost is shared in a specified way between both parties. There is a separate fee for overheads and profit. Since both parties have a common interest in minimising cost, the claims are substantially much reduced compared with an admeasurement contract and solution is quicker and easier.

In order to ensure the prompt involvement of the client in policy decisions, the institution of a high level project planning board is strongly recommended. Consequently joint planning can aid integration of design and construction, efficient use of resources and satisfactory achievement of objectives.

All parties are required to show an understanding of their new roles. Conditions of contract usually require clauses which should be clear and unequivocal. NEDO (1982) suggested that special attention should be given to those dealing with:

(a) the roles of the parties in joint planning and management;

(b) definitions of actual cost and fee, changes and target cost adjustment, construction plant, payment;

(c) conditions of contract and formalities for approval of expenditure;

(d) target adjustment and particularly methods for appraising the cost of change and the effects of inflation.

The use of this type of contract is applicable to any project when:

(a) There is a need for an early start to construction before design is complete and an expectation of considerable change in work content;

(b) The work is complex, technically or organisationally;

(c) The work contains major unquantifiable risks;

(d) There is involvement, by the client, in the management of the project or in industrial relations;

(e) Design input from the contractor is advisable;

(f) The client wishes to develop a local skilled construction labour force or to use the contract for instructing his own staff;

(g) The client for similar types of construction wishes to work with one contractor on a continuity basis while further demanding a flexible response to change;

5.3 CONCLUSION

Research into project management, such as measurement and evaluation, conditions of contract, types of contract, and organisational structures, has only recently tried to understand the reasons behind and results of traditional responses to identifiable risks, and in many

TABLE 5.3 RELATIVE MERITS OF TYPES OF CONTRACTS

(ASSUMING DESIGN AND CONSTRUCTION ARE CARRIED OUT BY DIFFERENT PARTIES)

CHARACTERISTIC	LUMP SUM	ADMEASUREMENT	TARGET COST	COST-REIMBURSABLE
Basis of payment.	single price.	Prices and Unit Rates.	Actual cost + Fee +-Incentive share.	Actual cost + Fee
Financial objectives of Client and Contractor.	Different but reasonably independent.	Different and in potential conflict.	Considerable harmony. Reduction of actual cost is a common objective if cost remains in the incentive region.	Both based on actual cost but potentially in conflict.
Flexibility for design change, variations.	Very limited.	Some.	Extensive.	Unlimited.
Evaluation of change by Client.	Little or no information available from tender.	Mainly based on tendered prices and rates.	Target adjustment based on actual costs and utilisation of resources or target rates if available.	Unnecessary for contractual purposes. Actual costs paid.
Design/Construction overlap: early start to construction.	Impracticable.	Feasible but relatively limited.	Considerable opportunity.	Construction may be started when first design package is available.
Contractor's involvement in design of permanent works.	Excluded.	Usually excluded.	Contractor encouraged to contribute ideas for reducing Actual Cost.	Contractor may be appointed for design input prior to construction.
Client involvement	Excluded.	Retrospective.	Recommended through joint planning.	Should be active.
Extent of control by Client.	Quality only.	Quality and retrospective control of payment for change.	Opportunity for active involvement in planning, resource use, quality.	Recommended active involvement in all aspects.

TABLE 5.3 RELATIVE MERITS OF TYPES OF CONTRACTS (CONTINUED)

CHARACTERISTIC	LUMP SUM	ADMEASUREMENT	TARGET COST	COST-REIMBURSABLE
Contractual status of Contractor's costs.	Confidential.	Confidential.	Open book accounts for actual cost. Fee confidential.	As for target cost
Payment for risks.	Undisclosed contingency in Contractor's tender.	Undisclosed contingency Contractor's tender plus claims.	Payment of actual cost of dealing with risk only if it occurs. Target adjusted accordingly.	Payment of actual cost
Identity of interests/ goodwill	Possible.	Possible but unlikely.	Probable harmony.	High potential, easily frustrated.
Competitive bidding.	Usual.	Usual.	Usual but negotiation not uncommon.	Restricted to fee only which is usually negotiated.
Claims resolution.	Very difficult -no basis for evaluation.	Difficult- Client has no knowledge of actual cost or hidden contingencies.	Potentially easy- based on actual costs or target costs. Mechanism needs careful drafting.	Unnecessary except for Fee adjustment -usually relatively easy.
Knowledge of final price at tender (excluding inflation).	Known.	Uncertain. Tender price usually increased by variations and claims.	Uncertain. Tender Target Cost usually increased by variations but effective joint management and efficient working can reduce final payment to below Target Cost.	Unknown.

Source: Perry, J. G. (1985), Contract Strategy in Construction Project Management, Ph. D Thesis, UMIST. pp. 98-99.

cases has concentrated on risk allocation, the pricing of and payment for risk, and insurance. Best-practice requires the plant and construction industry to remove cost overruns not forecast, to accept the presence of uncertainty and to differentiate between those factors which project management find controllable and uncontrollable. Risk management is not new to the plant and construction industry but there appears to be resistance to its examination as an integrated aspect of management decision making.

Project risk analysis can define the degree of probability of reaching project objectives without contingency funds. But the techniques of risk analysis have not been much applied within the plant and construction industry, and the more successful application of these sophisticated techniques currently seem to be limited to large projects.

With the use of risk analysis programmes such as CASPAR' (Computer Aided Simulation for Project Appraisal and Review) developed by Hayes and Perry (1986), the effects of uncertainty can be quickly estimated at the appraisal stage. Failer (1983) suggested that the effect of weather and other environmental factors can be integrated with risk analysis through a site-specific, computerised weather "model" based on actual weather records.

Both similarities and differences exist in the comparison of the diverse organisational structures available. This can be explained by examining target and cost-reimbursable contracts, fee contracts and management contracting. When looking at primary project objectives a similarity in terms of their possibility for time saving can be seen. Further, they all have the possibility of involving the contractor in the design. However, they differ in terms of flexibility, risk sharing between the parties and early recognition of final price (see Figure 5.4). The role of the client in the various structures and the type and size of project for which they are most fitted show further differences. Thus, it is imperative that great care is given to all factors in order to make the optimal choice as identified in section 5.2.

The choice of type of contract is not dependent on the type of work for which it is being considered but, instead, on a set of conditions which support the use of a specific type of contract. It is important to emphasize the interconnectedness of the decision on the type of contract with other strategic decisions. For instance, using a cost-based, management or package-deal contract may contribute to the objective of an early start to construction.

Price based contracts seem to give an ambience of secrecy and competitiveness and supply incentives to contractors through fear of loss or penalty. Cost-based contracts, on the other hand, produce openness and co-operation and give contractor's incentive through the realisation of mutual interests.

Finally, in the author's view, further research orientated towards the behavioural sciences within the plant and construction industry may contribute to a better understanding of the differences between organisational structures and the circumstances appropriate for their use.

NOTE

1. Thompson P.A. and Willmer G. CASPAR - A programme for engineering project appraisal and management. Presented at CIVIL-COMP '85 Conference, Institution of Civil Engineers, 3 - 5 December 1985 and published in Proceedings, Volume I. pp. 75 - 81. CASPAR - Computer Aided Simulation for Project Appraisal and Review - is a Project Management tool designed to model the interaction of time, resources, cost and revenue throughout the entire life cycle of a project. CASPAR has the capacity to evaluate the consequences of delay, escalation, and changes to the market or production rate, which occur at any time during development or operation. It can assist with the identification and analysis of the financial and construction risks associated with the engineering, operation, and management of the project.

CHAPTER 6

CONTEMPORARY PLANT AND OVERSEAS' CONSTRUCTION EXPORTS FROM DEVELOPED COUNTRIES

The present chapter deals with contemporary plant and overseas' construction exports from developed countries. The major concern here is to determine: a) the change in general plant exports from OECD countries since 1982 by applying the SITC method, which has already been introduced in Chapter 4; b) the trend of construction exports by major exporting countries and regions since 1982; and c) the characteristics of overseas' construction exports from developed countries. The chapter, through statistical investigation and findings, is expected to throw light on the export performance of developed countries in the plant and construction industry and, accordingly, deals with the following:

6.1 Contemporary plant exports from OECD Countries.

6.2 Contemporary overseas' construction exports from developed countries.

6.1 CONTEMPORARY PLANT EXPORTS FROM OECD COUNTRIES

Because of their high technology content and investment requirements, world plant exports are led by OECD countries, which share over 80.0 % of the total value of world plant exports.

This section discusses the change in the level and composition of general plant exports from OECD countries since 1982 and in general plant exports by major OECD countries in 1985 and 1986.

Exports from OECD Countries (1982-1986)

Table 6.1 shows the overall change in general plant exports from OECD developed countries (including railway vehicles and aircrafts) from 1982-1986. It can be seen that the ratio of plant exports to total exports ranged from 17.4 % to 19.1 %. Both total exports and plant exports marginally decreased from 1982 to 1983, but the trend gradually increased from 1984. In the case of total exports, growth from 1982 to 1984 and from 1984 to 1986 was 2.7 % and 9.7 %, respectively. Over comparable periods the growth of plant exports was minus 2.1 % and 14.1 %, respectively. The large decrease in plant exports in 1983 was occasioned by the prolongation and deepening of the global recession, the further slackening of demand pressures in the world oil market, and an abrupt slowdown in the flow of private bank credit to developing countries. The influence of the recession was reflected in a declining volume of imports into the industrial countries, and a marked drop in export prices and a worsening of the terms of trade for most developing countries. The falling demand for oil arose not only from

TABLE 6.1

The Change in General Plant Exports in OECD Countries (1982 – 1986)

Unit: US $ Million

Year / Production Classification	1982		1983		1984		1985		1986		Average Growth Rate per annum(%)		
	value	%	value	%	value	%	value	%	value	%	82–84	84–86	82–86
Total Exports	1,150,630	100	1,137,597	100	1,211,214	100	1,254,781	100	1,453,959	100	2.7	9.7	6.2
General Plant Total	220,239	19.1	203,467	17.9	210,288	17.4	224,883	17.9	272,816	18.8	-2.1	14.1	6.0
Railway Vehicles	2,387	0.2	2,127	0.2	2,688	0.2	1,934	0.2	2,501	0.2	7.7	0.6	4.2
Aircraft Etc	25,739	2.2	24,106	2.1	24,119	2.0	27,140	2.2	28,944	2.0	-3.1	9.6	3.2
Other General Plant	192,113	16.7	177,234	15.6	183,481	15.1	195,809	15.6	241,371	16.6	-2.1	15.0	6.5
Power Machinery Non-Elec	27,168	2.4	26,616	2.3	28,196	2.3	29,195	2.3	33,954	2.3	2.0	9.9	6.0
Agricultural Machinery	9,543	0.8	8,572	0.8	8,613	0.7	8,496	0.7	9,240	0.6	-4.9	3.7	-0.6
Textile & Leather Machinery	7,097	0.6	6,646	0.6	7,279	0.6	8,291	0.7	11,341	0.8	1.6	25.4	11.3
Metalworking Machinery	11,655	1.0	10,040	0.9	10,385	0.9	12,016	1.0	16,833	1.2	-5.3	27.9	13.5
Machines for Special Industries	35,731	3.1	30,294	2.7	30,940	2.6	35,010	2.8	43,010	3.0	-6.6	18.0	5.7
Machines NES Non-Elec	51,781	4.5	47,811	4.2	48,136	4.0	50,850	4.1	62,791	4.3	-3.5	14.5	5.5
Elec Power Mach, Switchgear	20,508	1.8	19,682	1.7	21,190	1.7	21,461	1.7	27,156	1.9	1.9	13.9	7.9
Electr Distributing Machinery	4,842	0.4	4,731	0.4	4,667	0.4	5,096	0.4	5,742	0.4	-1.9	10.9	4.5
Telecommunication Equipment NES	17,167	1.5	17,546	1.5	19,773	1.6	21,414	1.7	26,606	1.8	7.5	16.3	11.9
Structures, Parts Iron, Steel	6,621	0.6	5,296	0.5	4,302	0.4	3,980	0.3	4,698	0.3	-19.4	5.3	-7.1

Source: OECD Foreign Trade Series C, 1982 – 1986

UN; Yearbook of International Trade Statistics, 1982 – 1986 the general cyclical weakness of economic activity, but also from price-induced conservation and fuel substitution. A slowdown in international bank lending contributed further to a sharp drop in real imports of the non-oil developing countries. This development, in combination with a small decline in the real imports of the industrial countries and a marked slowing of import growth in the oil exporting countries, brought the first year-to-year decline in the volume of world trade since 1975 and in OECD countries' trade since 1980.

The surge in plant exports from 1984 to 1986 was probably due to three reasons. First, OECD countries committed more resources to the plant industry following the first oil price fluctuations in 1974 because the industry enjoys the highest level of added-value among major export industries and is highly resource efficient. Second, developed countries concentrated more on heavy machinery exports including plant than on exports of simple manufactured goods in order to increase foreign exchange earnings. Third, because manufactured goods constitute the dominant component of trade flows, there was a nominal price component linked to the accelerated general inflation of prices for exports of such goods.

General Plant Exports by Major Countries in OECD (1982 - 86)

It can be seen from Table 6.2 that of the 24 member nations of OECD the share of the six major exporters of general plant exports is about 80.0 %. The United States and West Germany have each maintained their OECD share of about 20.0 %, to remain the world's largest plant exporting countries. From 1982 to 1984, a number of major trends can be

TABLE 6.2

The Change in General Plant Exports by Major Countries in OECD (1982 - 86)

Unit: US $ Million, ( )%

Year / Country	1982	1983		1984		1985		1986		Average Growth Rate per annum(%)		
	value	value	% change	value	% change	value	% change	value	% change	82 - 84	84 - 86	82 - 86
Total General Plant Exports	220,239 (100)	203,467 (100)	92.4	210,288 (100)	103.4	224,883 (100)	106.9	272,816 (100)	121.3	-2.1	14.1	6.0
Total of Six Countries	176,279 (80.0)	169,461 (83.3)	96.1	167,459 (79.6)	98.8	178,532 (79.4)	106.6	214,502 (78.6)	120.1	-2.6	13.4	5.4
United States	52,886 (24.0)[1]	48,168 (23.7)	91.1	47,734 (22.7)	99.1	51,198 (22.8)	107.3	51,520 (18.9)	100.6	-4.9	4.0	- 0.5
West Germany	41,983 (19.1)	43,168 (21.2)	102.8	38,086 (18.1)	88.2	41,081 (18.3)	107.9	55,459 (20.3)	135.0	-4.5	21.5	8.5
Japan	27,736 (12.6)	29,439 (14.5)	106.1	34,066 (16.2)	115.7	35,484 (15.8)	104.2	45,097 (16.5)	127.1	10.9	15.7	13.3
United Kingdom	21,118 (9.6)	17,539 (8.6)	83.1	17,080 (8.1)	97.4	18,742 (8.3)	109.7	22,139 (8.1)	118.1	-9.8	13.9	2.1
France	17,369 (7.9)	16,512 (8.1)	95.1	16,229 (7.7)	98.3	16,650 (7.4)	102.6	19,939 (7.3)	119.8	-3.3	11.2	3.9
Italy	15,187 (6.9)	14,635 (7.2)	96.4	14,264 (6.8)	97.5	15,377 (6.8)	107.8	20,348 (7.5)	132.3	-3.1	20.1	8.5

Source: See Table 6.1
Note: 1. share ratio

identified. Japan increased its plant exports by over 10.0 %; the other five countries experienced negative growth. From 1984 to 1986, West Germany and Italy increased their plant exports by over 20.0 % and the others showed marked growth rates except for the US. In particular, Japan's growth exceeded 10.0 % in each year. From 1982 to 1986, Japan's average annual growth rate was 13.3 %, compared with an average annual growth rate for the United States of minus 0.5 %. The ratio of plant exports of West Germany, Japan and Italy to OECD total general plant exports increased slightly, but that of the United States, the United Kingdom and France decreased marginally.

General Plant Exports by Major Countries in OECD in 1985 and 1986

Table 6.3 allows us to compare general plant exports (including railway vehicles and aircrafts) in 1985. In 1985 the ratios of general plant exports of the United States, West Germany, Japan, United Kingdom, France and Italy to OECD total general plant exports were 18.5 %, 19.1 %, 17.9 %, 7.9 %, 7.1 %, and 7.3 %, respectively. For 1986 the ratios, respectively, were 14.8 %, 21.6 %, 18.5 %, 7.4 %, 7.1 % and 8.0 % (see Table 6.4). The large increase experienced by West Germany was probably due to successful bidding for contracts in Eastern Europe and various developing countries on the basis of quality, reliability, and the ability to meet delivery schedules and offer flexibility (all important West German firm-ownership and location-specific advantages). The success of Japanese firms owed much to a policy of under-bidding American and British companies with low-interest subsidised government financing, a policy which allowed Japanese firms to establish a foothold

TABLE 6.3

General Plant Exports by Major Countries in OECD, 1985

Unit: US $ Million,

Production Classification \ Country	OECD Total	%	United States	%	West Germany	%	Japan	%	United Kingdom	%	France	%	Italy	%
Total General Plant	224,883	100	51,198	18.3	41,081	18.3	35,484	15.8	18,742	8.3	16,650	7.4	15,377	6.8
Railway Vehicles	1,934	100	429	22.2	378	19.5	246	12.7	115	5.9	359	18.6	109	5.6
Aircraft Etc	27,140	100	14,498	53.4	3,343	12.3	118	0.4	3,121	11.5	2,430	9.0	1,064	3.9
Other General Plant	195,809	100	36,271	18.5	37,360	19.1	35,120	17.9	15,506	7.9	13,861	7.1	14,204	7.3
Power Machinery Non-Elec	29,195		8,758		4,125		3,789		3,491		2,189		956	
Agricultural Machinery	8,496		1,655		1,637		1,029		801		574		905	
Textile & Leather Machinery	8,291		530		2,379		1,541		355		319		1,017	
Metalworking Machinery	12,016		1,333		2,789		2,980		674		491		1,084	
Machines for Special Industries	35,010		7,741		7,383		4,870		2,827		1,872		2,848	
Machines NES Non-Elec	50,850		7,681		11,259		7,897		3,800		4,037		4,895	
Elec Power Mach, Switchgear	21,461		3,528		4,530		4,337		1,522		2,052		994	
Electr Distributing Machinery	5,096		961		729		896		411		475		261	
Telecommunication Equipment NES	21,414		3,870		1,970		7,299		1,243		1,398		834	
Structures, Parts Iron, Steel	3,980		214		559		482		382		454		410	

Source: See Table 6.1

TABLE 6.4

General Plant Exports by Major Countries in OECD, 1986

Unit: US $ Million

Country / Production Classification	OECD Total	%	United States	%	West Germany	%	Japan	%	United Kingdom	%	France	%	Italy	%
Total General Plant	272,816	100	51,520	18.9	55,459	20.3	45,097	16.5	22,139	8.1	19,939	7.3	20,348	7.5
Railway Vehicles	2,501	100	540	21.6	380	15.2	208	8.3	140	5.6	507	20.3	89	3.6
Aircraft Etc	28,944	100	15,287	52.8	2,823	9.8	146	0.5	4,063	14.0	2,287	7.9	1,035	3.6
Other General Plant	241,371	100	35,693	14.8	52,256	21.6	44,743	18.5	17,936	7.4	17,145	7.1	19,224	8.0
Power Machinery Non-Elec	33,954		8,804		5,557		4,940		4,098		2,753		1,493	
Agricultural Machinery	9,240		1,472		1,934		1,183		899		622		1,032	
Textile & Leather Machinery	11,341		592		3,498		2,071		443		472		1,450	
Metalworking Machinery	16,833		1,553		4,330		4,136		852		636		1,518	
Machines for Special Industries	43,010		7,114		10,607		5,790		3,204		2,549		4,086	
Machines NES Non-Elec	62,791		7,287		15,720		9,374		4,449		4,906		6,434	
Elec Power Mach, Switchgear	27,156		3,619		6,263		5,597		1,867		2,699		1,240	
Electr Distributing Machinery	5,742		994		945		941		363		466		345	
Telecommunication Equipment NES	26,606		4,102		2,657		10,055		1,433		1,600		1,025	
Structures, Parts Iron, Steel	4,698		156		745		656		328		442		601	

Source: See Table 6.1

in international markets for large projects.

The Structure of Exports by Major Countries in OECD in 1986

The general plant exports ratios of the United States and West Germany were 23.7 % and 22.9 % (see Table 6.5). If railway vehicles and aircraft are excluded, West Germany would equal the level of the United States. However, because the ratio of transport machinery such as ships and road motor vehicles to machinery is still high, Japan falls slightly behind the United States and West Germany in this highly technical intensive industry. But we must not overlook the fact that the general plant exports ratio of 21.6 % for Japan in 1986 compares with one of 15.0 % in 1975.

TABLE 6.5

Export Value by Major Countries in OECD, 1986

Unit: US $ Million, %

Product \ Country	OECD Total	%	United States	%	West Germany	%	Japan	%	United Kingdom	%	France	%	Italy	%
A. Total Exports	1,453,959	100	217,304	14.9	242,411	16.7	209,153	14.4	107,013	7.4	119,435	8.2	97,802	6.7
B. Industrial Product	1,152,017	100	148,867	12.9	217,319	18.9	203,359	17.7	80,018	6.9	92,166	8.0	86,094	7.5
C. Light Industrial Product	283,706	100	25,889	9.1	47,058	16.6	29,459	10.4	21,503	7.6	22,948	8.1	37,574	13.2
D. Heavy Chemical Product	868,311	100	122,978	14.2	170,261	19.6	173,900	20.0	58,515	6.7	69,218	8.0	48,520	5.6
D-1 Metal	111,813	100	5,202	4.7	22,032	19.7	17,549	15.7	6,829	6.1	10,621	9.5	7,964	7.1
D-2 Chemical Product	149,372	100	22,198	14.9	31,202	20.9	9,329	6.2	14,205	9.5	16,763	11.2	7,060	4.7
D-3 Machinery 1)	607,126	100	95,578	15.7	117,027	19.3	147,022	24.2	37,481	6.2	41,834	6.9	33,496	5.5
E. Heavy Machinery among Machinery	471,396	100	70,655	15.0	96,519	20.5	103,980	22.1	28,123	6.0	33,881	7.2	27,197	5.8
Plant Export	285,066	100	52,095	18.3	56,222	19.7	49,976	17.5	22,451	7.9	20,684	7.3	20,575	7.2
Ships & Boats	12,250	100	575	4.7	763	6.2	4,879	39.8	312	2.5	745	6.1	227	1.9
General Plant	272,816	100	51,520	18.9	55,459	20.3	45,097	16.5	22,139	8.1	19,939	7.3	20,348	7.5
Road Motor Vehicles	186,330	100	18,560	10.0	40,297	21.6	54,004	29.0	5,672	3.0	13,197	7.1	6,622	3.6
F. Light Machinery	135,730	100	24,923	18.4	20,508	15.1	43,042	31.7	9,358	6.9	7,953	5.9	6,299	4.6
Heavy Chemical Exports Ratio (D/A)	59.7		56.6		70.2		83.1		54.7		58.0		49.6	
Machinery Exports Ratio (D-3/A)	41.8		44.0		48.3		70.3		35.0		35.0		34.2	
General Plant Exports Ratio(General Plant/A)	18.8		23.7		22.9		21.6		20.7		16.7		20.8	
General Plant/ D-3	44.9		53.9		47.4		30.7		59.1		47.7		60.7	

Source: See Table 6.1
Note: 1) D-3 = E + F = SITC (7 + 6911)

6.2 CONTEMPORARY OVERSEAS' CONSTRUCTION EXPORTS FROM DEVELOPED COUNTRIES

This section discusses: a) the trend of world construction exports by region since 1982; b) the trend of construction exports by major exporting countries and regions since 1982; and c) characteristics of overseas' construction exports from developed countries. The section concludes with some implications for the trend in overseas construction exports.

6.2.1 THE TREND OF WORLD CONSTRUCTION EXPORTS BY REGION (1982-87)

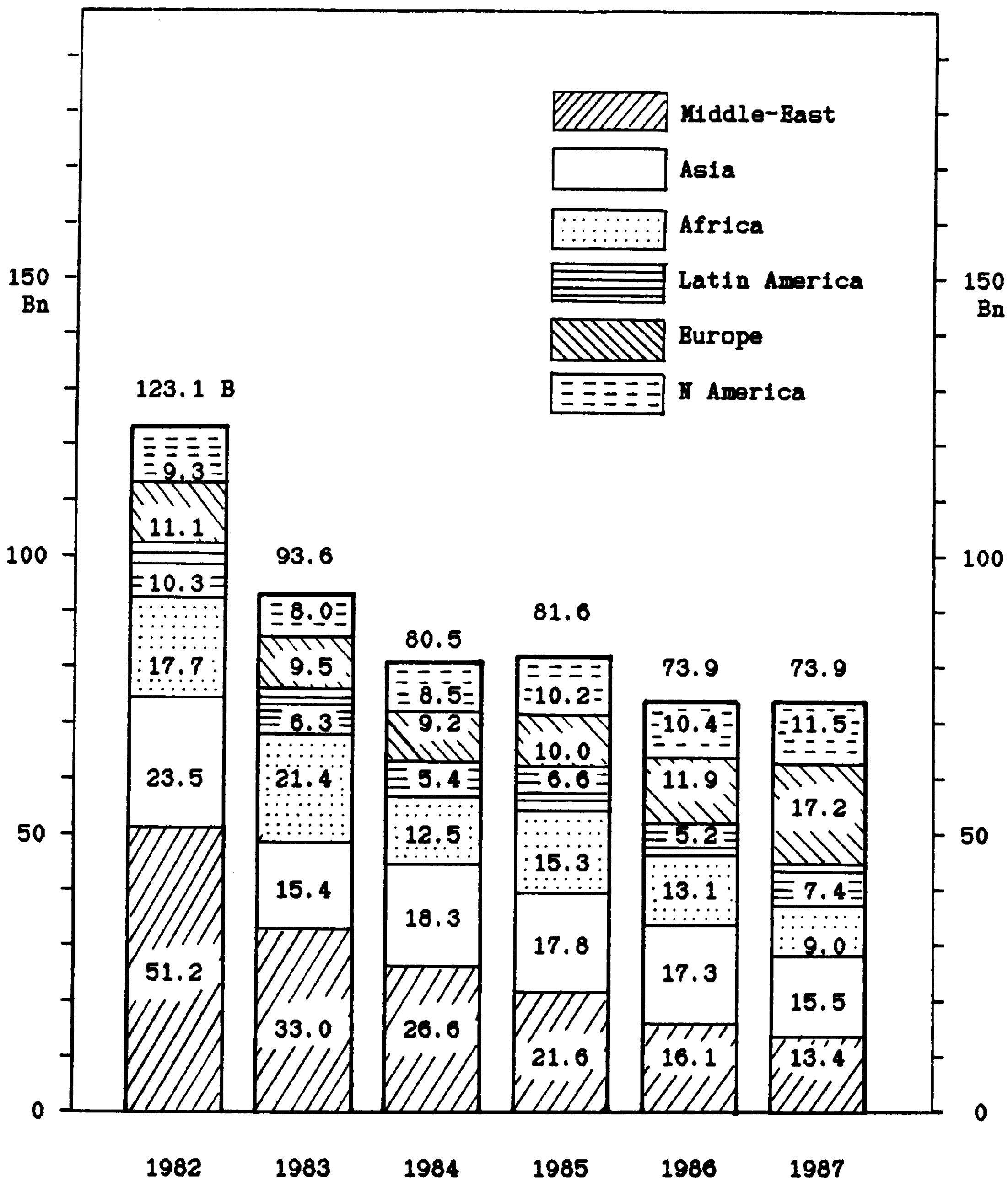
As can be seen in Graph 6.1, the top 250 international contractors won a total of US $ 123.1 bn (billion) in new work abroad in 1982. They exported US $ 51.2 bn to the Middle-East (41 %), US $ 23.5 bn to Asia (19.1 %), US $ 17.7 bn to Africa (14.4 %), US $ 10.3 bn to Latin America (8.4 %), and US $ 20.4 bn to Europe and North America (16.6 %). Together, the Middle-East, Asia and Africa accounted for over 75.0 % in 1982.

In 1983 overseas contracts fell by 24.0 % to US $ 93.6 bn. The Engineering News-Record's annual survey showed that the worldwide construction recession cut awards to foreign firms by more than a third in three of four developing regions. Only the African market gained, largely from a huge project, a US $ 3.3 bn water transmission scheme in Libya, which increased African volume 21.0 % to US $ 21.4 bn. Elsewhere, the number of new contracts was substantially reduced: Middle-East awards fell 35.5 % (from US $ 51.2 bn to US $ 33.0 bn),

Graph 6.1

World Total Construction Exports by Region (1982 - 1987)

Unit: US$ Billion



(Source: Engineering News-Record, July 21, 1983, July 19, 1984, July 18, 1985, July 17, 1986, July 16, 1987, July 7, 1988).

Asian contracts declined by 34.5 % (from US $ 23.5 bn to US $ 15.4 bn), and Latin American contracts declined 38.8 % (to US $ 6.3 bn).

Foreign work in 1984 fell 14.0 % to US $ 80.5 bn, continuing a slide that began with a 5.2 % drop in 1982 and a further 24.0 % fall in 1983. Of the six regions, only the Asian and North American markets gained. Multi-billion dollar expansions of two LNG (Liquefied Natural Gas) projects were enough to lift the volume of Asian awards 18.8 % to US $ 18.3 bn. Without them, Asian volume would have been down 20.0 %. An increase of 55.6 % in contracts awarded to non-American firms in a booming US market offset a 34.1 % drop in Canadian contracts, to raise North American volume 6.3 % to US $ 8.5 bn. Elsewhere, new contract volume fell substantially again in 1984: Middle-East awards fell 19.4 % to US $ 26.6 bn and African work fell 41.6 % to US $ 12.5 bn. Latin American volume, which dropped 38.8 % in 1983, fell by another 14.3 % to US $ 5.4 bn. European awards to non-domestic firms fell by 3.2 % to US $ 9.2 bn. The large decrease in African work can be attributed to a continued weakness of economic activity, a worsening terms of trade, higher debt service payments, and increased food imports following a drought that had affected much of the continent.

Foreign work in 1985 increased by only 1.4 % to US $ 81.6 bn, ending a three-year slide from a peak of US $ 129.9 bn in 1981. Gains in four of the six regional markets combined to offset declines in the two largest markets: the Middle-East and Asia. New contracts won by foreign firms in the Middle-East decreased 18.8 % to US $ 21.6 bn, less than half of the US $ 51.2 bn peak reached in 1982. Asian volume was relatively stable, with the reduction of less than 3.0 % to US $ 17.8 bn. African contracts recorded the greatest increase of any region -

22.4 % to US $ 15.3 bn with American, British and Japanese contractors winning nearly three times as much new work there as they did during 1984 (see Graph 6.2 and 6.2-1). Latin American volume increased more than 22.2 % to US $ 6.6 bn. Non-American contractors made another strong showing in the U.S. market, where work was up 20.0 % to US $ 10.2 bn. In Europe, awards to foreign firms were up 8.7 %, to reach US $ 10 bn, after a 3.2 % decline in 1984.

After a tiny increase in 1985, foreign work in 1986 decreased by a marginal 9.5 % to US $ 73.9 bn, resuming its decline from the 1981 peak of US $ 129.9 bn. New contracts in the Middle-East decreased 25.4 % to US $ 16.1 bn, dropping that region out of the top position for the first time since 1978. Asian contracts were down only 2.6 % to US $ 17.3 bn, earning the region first place among the six regions. African contracts dropped 14.8 % to US $ 13.1 bn in 1986, but the region remained the third most productive for foreign contractors. Europe posted the biggest gain of any region, with a 19.3 % increase in new work, to US $ 11.9 bn. In the North American market, awards to foreign firms were up about 2.0 %, to reach US $ 10.4 bn. After a 22.2 % surge in 1985, Latin American volume stepped back nearly the same amount in 1986 to US $ 5.2 bn.

Foreign contractors in 1987 repeated the 1986 value of US $ 73.9 bn. This may have been due to weaker foreign demand resulting from lower oil prices, mounting Third World debt, more intense competition and, in some instances, unfavourable exchange rates. Many contractors may have picked their foreign targets more carefully or concentrated on strong domestic markets. In 1987 the value of new contracts won by foreign firms in Latin American, European and the North American markets increased by 42.3 %, 44.5 % and 10.6 %, respectively. In particular, European volume surged to US $ 17.2 bn, to lift the region from fourth to first place among the six geographic areas, dropping Asia from first to second place with a 10.4 % decline in work to US $ 15.5 bn. It is worth remarking that China was second only to Saudi Arabia in attracting foreign contractors in 1987. The impact of much lower oil prices on the construction budgets of Middle-East countries depressed contract volume a further 16.8 % to only US $ 13.4 bn, dropping the region into third place. Africa slipped to fourth, down 31.3 % to only US $ 9 bn in new work for foreign contractors.

6.2.2 THE TREND OF CONSTRUCTION EXPORTS BY MAJOR EXPORTING COUNTRIES

Table 6.6 shows the change of overseas construction exports among the Top 250 international contractors from the major exporting countries from 1982-87. Total construction exports substantially decreased from 1982 to 1984, with an average annual growth rate of minus 19.0 %. This can be attributed to sluggish plant construction (resulting from a downturn in oil prices) in the Middle-East, which shares 30.0 % to 40.0 % of global orders, a decline in foreign exchange reserves in developing countries and world business stagnation.

From 1982 to 1983, only Turkey and the Netherlands increased their annual growth rate by over 25.0 %. The United States, South Korea and West Germany showed severe negative rates of -34.5 %, -24.6 %, and -43.2 %, respectively. France and Britain also showed a marked decrease of over 12.0 %; other countries showed slighter decreases. In 1984 the trends in overseas construction exports were similar to those of 1983,

TABLE 6.6

The Change in Construction Exports by Major Exports Countries (1982 - 1987)

Unit: US $ Billion, %

Country \ Year	1982	1983		1984		1985		1986		1987		Average Growth Rate per annum(%)		
	value	value	% change	value	% change	value	% change	value	% change	value	% change	82-84	84-87	82-87
Total Exports	123.1 (100)	93.6 (100)	76.0	80.5 (100)	86.0	81.6 (100)	101.4	73.9 (100)	90.6	73.9 (100)	100.0	-19.0	- 2.7	- 9.2
United States	44.9 (36.5)	29.4 (31.4)	65.5	30.7 (38.1)	104.4	28.2 (34.6)	91.9	22.6 (30.6)	80.1	18.1 (24.5)	80.1	-15.0	-16.0	-15.6
South Korea	13.8 (11.2)	10.4 (11.1)	75.4	6.6 (8.2)	63.5	4.8 (5.9)	72.7	2.6 (3.5)	54.2	2.1 (2.8)	80.8	-31.0	-30.8	-30.9
France	11.4 (9.3)	10.0 (10.7)	87.7	5.3 (6.6)	53.0	6.7 (8.2)	126.4	7.1 (9.6)	106.0	8.6 (11.6)	121.1	-29.7	17.8	- 1.2
West Germany	9.5 (7.7)	5.4 (5.8)	56.8	4.8 (6.0)	88.9	5.4 (6.6)	112.5	5.5 (7.4)	101.9	5.9 (8.0)	107.3	-27.1	7.2	- 6.5
Japan	9.3 (7.6)	8.7 (9.3)	93.5	7.3 (9.1)	83.9	11.6 (14.2)	158.9	9.4 (12.7)	81.0	9.9 (13.4)	105.3	-11.3	15.1	4.5
Italy	7.8 (6.3)	7.2 (7.7)	92.3	6.8 (8.4)	94.4	8.7 (10.7)	127.9	7.4 (10.0)	85.1	9.2 (12.4)	124.3	- 6.7	12.4	4.8
Britain	7.5 (6.1)	6.4 (6.8)	85.3	5.6 (6.9)	87.5	5.6 (6.9)	100.0	7.0 (9.5)	125.0	7.9 (10.7)	112.9	-13.9	12.6	2.0
Turkey	2.7 (2.2)	3.4 (3.6)	125.9	1.9 (2.3)	55.9	1.6 (2.0)	84.2	2.2 (3.0)	137.5	0.8 (1.1)	36.4	- 9.1	-14.0	-12.0
Netherlands	2.0 (1.6)	2.5 (2.7)	125.0	1.2 (1.5)	48.0	1.4 (1.7)	116.7	1.1 (1.5)	78.6	1.4 (1.9)	127.3	-13.5	7.5	- 0.9
Other	14.2 (11.5)	10.2 (10.9)	71.8	10.4 (12.9)	102.0	7.6 (9.3)	73.1	9.0 (12.2)	118.4	10.0 (13.5)	111.1	-13.1	0.9	- 4.7

Source: Engineering News-Record, July 21, 1983, July 19, 1984, July 18, 1985, July 17, 1986, July 16, 1987, July 7, 1988.
Note: ( ) share ratio

except for the United States, Turkey and the Netherlands. The United States showed a marginally increased rate (compared with the severe decrease in 1983) and the Netherlands and Turkey demonstrated sharply decreasing rates after recording large increases in 1983. In 1985, Japan, Italy and France showed large increased rates of 58.9 %, 27.9 % and 26.4 %, respectively. West Germany and the Netherlands showed marginally higher rates. All other countries indicated minus growth rates. In particular, Korea showed a large reduction with a decreased rate of about 27.3 %. In 1986 only Britain and Turkey showed a large expansion, with growth rates in excess of 25.0 %. France and West Germany indicated a small increasing rate. All other countries showed minus growth rates. Korea particulary showed a dramatic reduction, continuing its decline with a rate of 45.8 % to US $ 2.6 bn (less than quarter of the US $ 13.8 bn recorded in 1982). In 1987, Italy, France and the Netherlands showed a marked expansion with growth rates in excess of 21.0 %. Britain, West Germany and Japan showed marginally higher rates. All other countries showed minus expansion rates. Turkey suffered a steep reduction of 63.6 %.

On the whole, from 1982 to 1987, only Japan, Italy and Britain showed some expansion, with growth rates of over 2.0 %. The United States (the largest exporting country) and Korea indicated a marked reduction, with a negative rate of 15.6 % and 30.9 %, respectively. (The yearly trend of overseas' construction exports by major exporting countries from 1982 to 1987 can be seen from Graph 6.2 and 6.2-1.)

6.2.3 THE TREND OF CONSTRUCTION EXPORTS BY MAJOR COUNTRIES AND REGIONS

The change of construction exports by major exporting countries and regions can be seen from Graph 6.2 (1982 -1984) and Graph 6.2-1 (1985-1987).

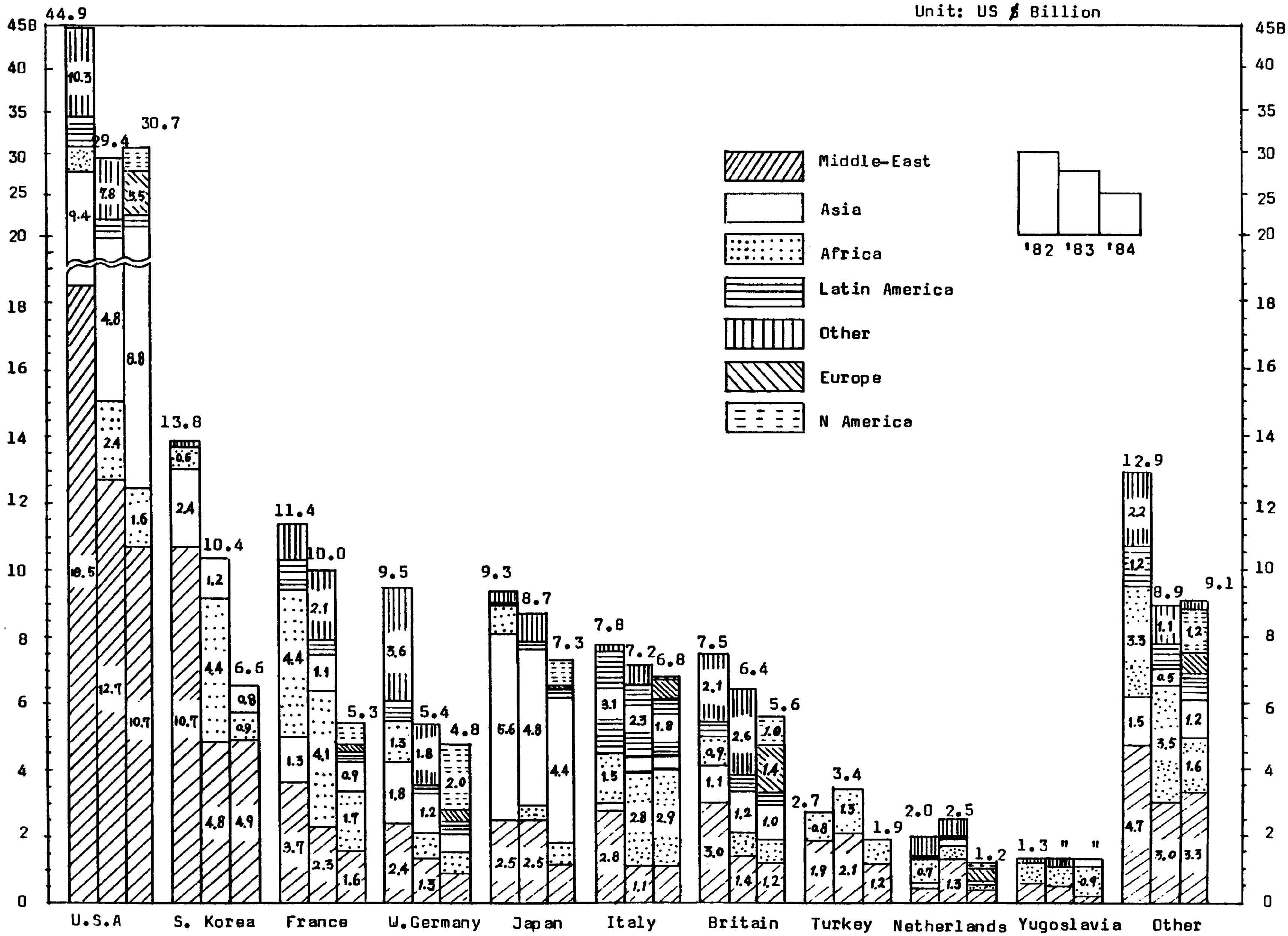
The United States

American firms won a total of US $ 44.9 bn in foreign contracts in 1982. They became more dependent on the Middle-East than ever before, drawing more than 41.2 % of their work from the region, compared to only 23.6 % in 1981. American dependence on Asia (20.9 %), Europe (15.1 %) and Africa (6.2 %) was about the same as the previous year. Substantial changes took place in Latin America (8.7 %, down from 20.6 %) and in Canada (8.0 %, down from 12.5 %). Foreign contracts won by US firms fell to US $ 29.4 bn in 1983, a reduction of more than one-third over 1982. America's dependence on the Middle-East increased marginally from 41.2 to 43.2 % of their total foreign contracts. Asia was again their second most important market, accounting for 16.3 % of new work, down from 20.9 % in 1982. American dependence on Europe, Canada, Africa and Latin America changed only slightly. American contractors won a total of US $ 30.7 bn in foreign contracts in 1984, a slight recovery from their depressed US $ 29.4 bn total in 1983. From 1983 to 1984 the other major exporting countries showed negative growth rates, in particular France, Turkey and the Netherlands, with negative rates in excess of 44.0 %. This may be attributable to a major increase in Asia's share, for example, up from 16.3 % to 28.7 % in 1984. The shares in other regional markets changed little, rising from 16.0 to 17.9 % in Europe; from 8.2 % to 5.2 % in Africa and from 5.8 % to 5.2 % in Latin America. In part, the volatility of volume changes reflects the degree of

Graph 6.2

The Change in Construction Exports by Major Countries and Region(1982 -1984)

Unit: US $ Billion

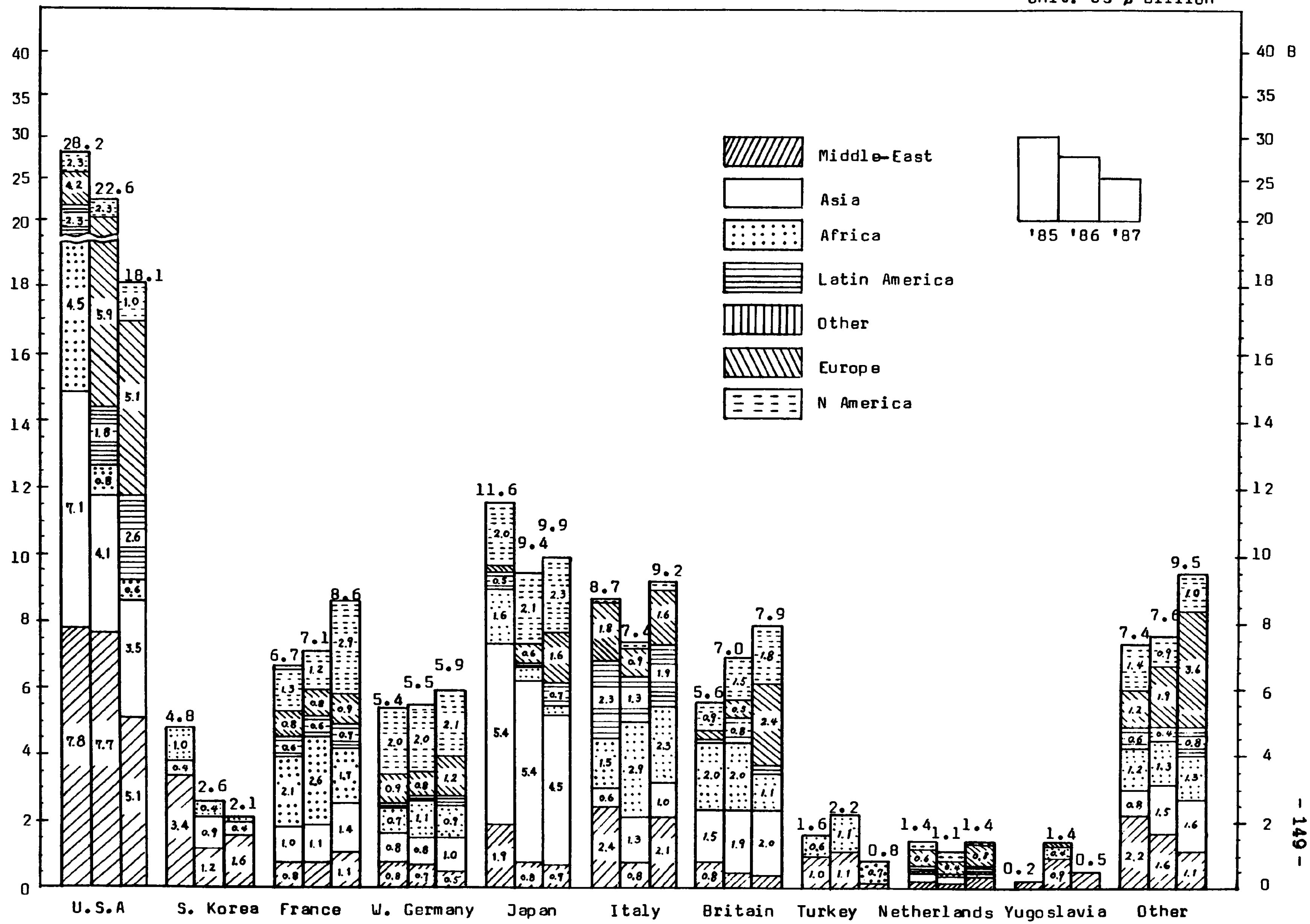


(Source: Engineering News-Record, July 21, 1983, July 19, 1984, July 18, 1985)

Graph 6.2-1

The Change in Construction Exports by Major Countries and Region (1985 - 1987)

Unit: US $ Billion



Source: See Graph 6.1

competition among the major countries.

American contractors won a total of US $ 28.2 bn in foreign contracts in 1985. They led all nationality groups in each of the regional markets, but their share of contracts was down in all regions except Africa and Latin America. The Middle-East accounted for only 27.7 % of their foreign total, down from 34.9 % in 1984. Asia was their second most important market, contributing 25.2 % of new foreign work, down from 28.7 % in 1984. The Americans' foreign contract volume in 1986 declined 19.9 % to US $ 22.6 bn. However, they improved their share of awards in their two most important regions, the sagging Middle-East market (up from 34.9 % to 47.6 %), and the growing European market (42.3 % to 49.7 %). American firms lost a considerable share of the market in Asia, dropping from 39.9 % to 23.8 %, and plummeted to only a 6.1 % share of African contracts compared with 29.4 % in 1985. Their market share remained steady in Latin America (34.6 %) and in North America (22.1 %). In 1987, American firms won a total of only US $ 18.1 bn in foreign contracts, their lowest total since 1979. Their dependence on the Middle-East decreased markedly from 34.1 to 28.2 % of their total foreign contracts. However, their dependence on Latin America increased markedly from 8.0 % to 14.4 %. Their dependence on Europe and Asia changed only slightly.

Korea (South)

The change of Korean construction exports by region will be explained separately in the next chapter.

France

The French repeated its performance as the largest European group in 1982, although its contract volume fell by 8.8 % to US $ 11.4 bn. Africa was the favourite market for French contractors, accounting for 38.6 % of their total, up from 25.6 % in 1981. The Middle-East, which displaced Africa as the favourite French market in 1981, contributed 32.5 % to the French total in 1982. Asian volume remained at 11.4 %. In 1983, Africa was also the favourite market of the French, accounting for 41.0 % of their foreign total, up slightly from 38.6 % in 1982. The Middle-East share of the French total dropped to 23.0 % in 1983. Asian contracts remained at 11.0 %, and European contracts grew to 9.0 % from less than 3.6 % in 1982. Canada and the US each contributed 6.0 % of the total of French foreign contracts in 1983, while Latin America contributed 4.0 %, half of its 1982 share. French contractors drew 32.1 % of their foreign work from Africa in 1984, compared to 41.0 % in 1983. The Middle-East accounted for 30.2 %, up from 23.0 %. Other important markets were Asia (17.0 %, up from 11.0 %); and the US (11.3 %, up from 6.0 %). France's construction industry encountered difficulties in 1984, when the number of construction companies which went out of business rose by 10.8 %, the number of hours worked decreased by 14.5 % and the workforce fell by 7.6 % (Financial Times, 12th April 1985).

French contractors won US $ 6.7 bn in foreign work in 1985, to move from sixth to fourth. They made their biggest gains in Europe and North America, boosting volume in each region by about US $ 0.6 bn. New contracts business also was up 23.5 % to US $ 2.1 bn in Africa, and small gains in Asian and Latin American contracts helped offset a US $ 0.8 bn drop in the Middle-East awards. French firms boosted their foreign volume by 5.4% to US $ 7.1 bn in 1986. Almost all of that increase came from Africa. Their contract volume and share of the market changed only slightly in all other regional markets. In 1987 their contract volume increased by 21.1 % to US $ 8.6 bn. North America was their most favourite market, accounting for 33.7 % of their total, up from 16.9 % in 1986. French dependence on Africa decreased markedly from 36.6 % to 19.8 % of their total foreign contracts.

West Germany

German contractors came second among the Europeans in total volume abroad, winning US $ 9.5 bn, a 5.0 % decline from 1981. German firms won 25.3 % of their contracts in the Middle-East (down from 30.0 % the previous year); 23.0 % in the US (down from 32.0 %); 18.9 % in Asia (up from 11.0 %); 13.7 % in Africa (down from 19.0 %); 11.0 % in Europe (up from 6.0 %); and 4.2 % in Latin America (up from 2.0 %). German contractors dropped from second to fourth among the Europeans in foreign contract volume, winning only US $ 5.4 billion abroad in 1983, a 43.2 % decline. This decrease was due to a fall in demand from OPEC countries and increased competition from low-wage contractors, such as the Turkish and Korean companies. Thus, German contractors had to look for business in sectors which require more technical expertise, planning and project management skills, and by seeking new markets. Besides their normal construction business, they tried to penetrate markets as designers, construction advisors and contract managers, and tried to get a bigger share in turnkey business. They began to seek work in China, particularly in assisting Chinese contractors with designing and managing contracts. The US was the top market for German firms in 1983, accounting for 25.9 % of their foreign volume, and the Middle-East was second at 24.1 % (down from 25.3 %). In 1984 the US market accounted for 41.7 % of their foreign volume and the Middle-East share was 18.8 %, down from 24.1 %. The continued depreciation of the Deutschemark during 1984 resulted in a deterioration in the US terms of trade. Also, export growth was held back during the first half of 1984 by a strike of metal-workers.

German contractors' foreign volume was up about US $ 0.6 bn in 1985, maintaining the same level as that of 1983 (US $ 5.4 bn), with increases of US $ 0.5 bn in Europe, and US $ 0.3 bn in Asia. Their volume remained steady at about US $ 2.0 bn in their biggest market, North America, and at US $ 0.7 bn in Africa. In 1986 German firms raised their foreign contract volume by only 2.5 %. A 57.1 % gain in Africa, pushing their volume in the region past the US $ 1.0 bn mark, was offset by drops of 12.5 % in the Middle-East, 11.1 % in Europe and 50.0 % in Latin America. The major contributor to the foreign contract volume of German firms also came from the North American market, accounting for US $ 2.0 bn of the US $ 5.5 bn. In 1987 the change of construction exports by region was similar to that of 1986 except for Europe, which accounted for 20.3 % of their foreign work.

Italy

Italian contractors won a total of US $ 7.8 bn abroad in 1982, down 4.9 % from the previous year. Contrary to the experience of most other national groups, the Italians held their ground in Latin America, their most productive market again in 1982. Although their Latin American contracts slipped from US $ 3.3 bn to US $ 3.1 bn, they represented 39.7 % of the Italian total. Middle-East contracts accounted for 35.9 % and

African work for 19.2 %. In 1983, Italian contractors were placed second among the Europeans in total volume abroad, winning US $ 7.2 bn, down 7.7 % from 1982. Africa displaced Latin America as the favourite market, accounting for 38.9 % of their foreign volume. Latin America was the second most important market for the Italians, although the region produced only 31.9 % of Italian contracts. Italian contractors made the strongest showing among European members in 1984. They won a total of US $ 6.8 bn. They increased their volume by 3.5 % to US $ 2.9 bn in Africa, their most important market. They also maintained the lead in Latin America, although their volume there was down 26.5 % to US $ 1.8 bn. The characteristics of Italian awards are not relatively dependent on a specific region, as is the case with other major countries. Their most important markets were the Middle-East in 1980, Latin America from 1981 to 1982, and Africa from 1983 to 1984. However, their most important market was Latin America from 1980 to 1984, accounting for a third of their total volume abroad in that region. Economic deterioration in Latin America severely affected Italian construction exports, causing their export volume to show a minus growth. Like other mature European contractors, Italian contractors suffered from increased competition from contractors with lower labour costs, particularly Turkish and South Korean ones. Thus, they had to search for a way out of their difficulties through turnkey projects, and more sophisticated contracts in which management and technical skills are required. Attempts were also made to expand their involvement in China and the Far East.

In 1985 Italian contractors strengthened their hold on third place. They boosted contract volume in every region except Africa, where their new work dropped from US $ 2.9 bn to US $ 1.5 bn. They more than offset this loss by raising their Middle-East awards from US $ 1.1 bn to US $ 2.4 bn, European awards from US $ 0.5 bn to US $ 1.8 bn, and Latin American awards from US $ 1.8 bn to US $ 2.3 bn. Italian contractors' foreign volume fell 14.9 % in 1986 to US $ 7.4 bn. They Italians more than doubled their share of foreign awards in Asia and in Africa, their most important market, but had their percentages cut by more than half in the Middle-East and Europe. In Latin America, their share slipped from 26.4 % to 17.6 %. The Italians' foreign contract volume in 1987 increased 24.3 % to US $ 9.2 bn. They improved their share of awards in the Middle-East (up from 10.8 % to 22.8 %). They won US $ 2.3 bn in African contracts in 1987, to lead all nationality groups. Much of their success was the result of a government plan that has offered more than US $ 1.0 bn in aid to developing countries over 18 months (Engineering News-Record, July 7, 1988).

Britain

British contractors' foreign volume slipped 5.1 % in 1982, to US $ 7.5 bn. They more than doubled their Middle-East contracts to US$ 3.0 bn, 40.0 % of their foreign total. But their African volume fell from US $ 3.0 bn (38.6 % in 1981), to US $ 900 million (12.0 %). The US $ 1.5 bn in US contracts won by British firms in 1982 made it their second most productive market, accounting for 20.0 % of their foreign volume. Foreign volume fell a further 14.7 % in 1983, to US $ 6.4 bn. A US $ 1.2 bn increase in contracts won in other European countries (from only US $ 200 million in 1982) lifted Europe into a tie with the Middle-East as the most productive market for the British. Each accounted for 21.9%

of the total. In 1984 British contractors' foreign volume declined 15.6 % to US $ 5.6 bn. Work in other European countries accounted for 25.0 % of the total foreign volume. The Middle-East market slipped to second, at 21.4 %. A large part of this decrease in 1984 could be attributed to the effects of the year-long strike by coal miners.

In 1985 British contractors matched the US$ 5.6 bn foreign contract total that made the list in 1984. They made all the gains in two regions, nearly tripling African contracts to US$ 2.1 bn, and increasing Asian awards by 50.0 % to US$ 1.5 bn. The biggest decline for the British was in the European market, which dwindled from US$ 1.4 bn to only US$ 0.3 bn. Their contracts were reduced by a third in the Middle-East, to US$ 0.8 bn, and by 10.0 % in North America, to US$ 0.9 bn. Latin American contracts almost dried up completely for the British, comprising less than 2.0 % of their total. British contractors accumulated gains in four of the six regional markets to forge a US$ 1.4 bn increase in their foreign contract volume for 1986. The 25.0 % growth was made possible by a strong comeback in Latin America; a US$ 0.6 bn increase in North America; a US$ 0.4 bn increase in Asian work; and an 66.7 % increase in contracts elsewhere in Europe. British firms fared worse only in the Middle-East, where their volume dropped by half to less than US$ 0.4 bn. In 1987 their contract volume rose by US$ 0.9 bn to US$ 7.9 bn. The biggest increase for the British was in the European market, which steeply increased from US$ 0.5 bn to US$ 2.4 bn. Their contracts were nearly halved in Africa, to US$ 1.1 bn.

Japan

Japanese contractors' foreign volume rose by US $ 1.1 bn to US $

9.3 bn in 1982. However, their market shares shifted sharply in favour of work closer to home. Middle-East contracts, which had accounted for 47.6 % of Japanese volume in 1981, dropped to only 26.9 %, while the Asian share jumped from 29.3 % to 60.2 % of the total. The Japanese displaced the Koreans as the nationality with the second largest number of companies among the top 250: 34 firms in 1983, seven more than in 1982, but their combined foreign volume dropped 6.5 % to US $ 8.7 bn, mostly in Asia and the Middle-East. Middle-East contracts accounted for 28.7 %, a slight recovery from 26.9 % in 1982, but well below the 47.6 % level for 1981. In 1984 the Japanese maintained their position as the second largest nationality group among the top 250, winning a total of US $ 7.3 bn abroad, a 16.1 % decline from 1983. Asian contracts outside Japan accounted for 60.2 % of the Japanese total, up from 55.2 % in 1983. Middle-East contracts represented only 16.4 % of the total, compared with 28.7 % in 1983. Increased Japanese activity in Africa raised the share of contracts there from 4.5 to 8.2 % in 1984. Work in the US also grew from less than 5.0 % to 9.6 % of Japan's foreign total. Japan forecast that the Middle-East market would decline and planned the diversion of its activities to the Asian and US market. As a consequence, Japan was able to prevent a sharp decline in foreign volume and became the second largest exporter as measured by the number of firms among the top 250.

In 1985 Japanese contractors' foreign volume dramatically rose by US $ 4.3 bn to US $ 11.6 bn, sharing 14.3 % of world total contract volume. Their Asian contracts outside Japan grew from US $ 4.4 to US $ 5.4 bn, by far their largest regional market. The North American market became the second most important to Japanese contractors in 1985, contributing almost US $ 2.0 bn, overtaking the stagnant Middle-East market, which held at 16.4 % of Japanese foreign volume. African awards were up US $ 1.0 bn, to make up 13.8 % of their total, up from 8.2 % in 1984. Their foreign contract volume in 1986 was down more than 19.0 % to US $ 9.4 bn. The Japanese boosted to 31.2 % their share of Asia, their most important market, which accounted for 57.4 % of their foreign work in 1986. They lost a few percentage points in their share of the market in the Middle-East, Africa and Latin America, and gained slightly in Europe and North America. In 1987 foreign contracts won by Japanese firms marginally increased to US $ 9.9 bn. Their dependence on Europe increased markedly from 6.4 to 16.2 % of their total foreign contracts, raising their volume from less than US $ 0.6 bn to nearly US $ 1.6 bn. Europe trailed only Asia and the U.S. as a source of new work for the Japanese.

6.2.4 CHARACTERISTICS OF OVERSEAS' CONSTRUCTION EXPORTS FROM DEVELOPED COUNTRIES

Firstly, world overseas construction exports since 1981 have been severely reduced due to low levels of plant construction resulting from a decline of foreign exchange earnings in Middle-East oil exporting countries and among developing countries. Contract volume in the Middle-East (sharing 30-40 % of world construction markets) has reduced steeply in recent years, partly because of declining oil prices and export volumes and partly from hostilities that have continued in several countries in the region. Thus, the region's combined export earnings declined by some 43.0 % from 1980 to 1984, after having increased by nearly 100 % from 1978 to 1980. Although the oil exporting countries sustained their spending and imports at a high level during 1981-82, the continued decline in export earnings necessitated a scaling down of their spending and imports from 1983 onward. Further, the Latin American region, depending heavily on borrowing a large part of its development finance from the international money market, reduced markedly their overseas construction orders in consequence of the foreign debt crisis which largely affected that region.

Overseas construction volume in the United States went against the general trend and increased, Japan in particular extending its business in the United States' market.

As can be seen from Graph 6.2 and 6.2-1, excluding the US, the largest contracts in each region have gone to a different country. Thus, Asia is the most productive market for Japan. This can be attributed to a long-standing economic and technical co-operation between Asia and Japan and to heavy Japanese subsidies. Latin America is the most productive market for Italy, because of strong political and economic ties and Italian specialisation in huge dams and harbours such as the Yacyreta dam construction contract in 1983, which was valued at US $ 1.2 billion. Italian firms also have the capability to give suppliers' credit to Latin American countries.

6.2.5 IMPLICATIONS FOR OVERSEAS' CONSTRUCTION EXPORTS

The fact that the major features of overseas' construction exports are consistent with those underlying the eclectic theory suggests that there are matching explanations for the pattern of multi-national manufacturing and multi-national contracting.

It is perhaps not surprising that the Middle-East was the major market for most contractors, with the exception of French, Italian and Japanese contractors who concentrated in the African, Latin American, and Asian markets respectively (with the French contractors dominating the African market). American contractors dominate the industry overall, and are the major producers in three out of four of the markets.

Firms from particular countries involved in international contracting are clearly exploiting their advantages better than others, or are better able to develop and exploit such advantages. The exploitation of ownership advantages occurs on two levels; firstly, economic rent can be earned from those factors that differentiate the country's contractors from its competitors and are incorporated into the business of the firm, and secondly by the sourcing of these advantages in the location where they will be most in demand. For example, Korea has an abundance of unskilled and semi-skilled labour available for use on overseas construction projects. This helped Korean contractors by 1983 to underbid developed country contractors in countries where this cheap labour could be employed. Thus, South Korean contractors have an ownership advantage that is specific to them and was particularly relevant in the Middle-East market. In cases where the ownership advantage occurs because of links between the home and host countries, the advantage is fixed to a specific host country location, as in French historic links with Africa and Italian links with Latin America. However, this specific advantage may not be useful elsewhere if different circumstances apply. Hence, contractors with advantages that are fixed to a specific location must generate other advantages if they wish to work in other locations. This illustrates a second point about ownership advantages; firms will usually have access to several advantages that may be exploitable in different regions according to the nature of these advantages.

It is clear from Graph 6.2 and 6.2-1 that some firms are utilising ownership advantages that are demanded in the developing regions to a greater extent than others. French contractors, for example, are providing services that are demanded in Africa to the extent that they are outperforming other contractors in the region. A similar argument can be put forward for US dominance overall of the industry, and Japanese success in Asia, North America and, more recently, Europe. In all cases contractors are exploiting factors that differentiate them from other contractors in those regions and help them to win contracts by doing so.

6.3 CONCLUSION

A tentative conclusion of this discussion is that the contracting firm must differentiate the services it offers in order to win contracts in overseas markets. In general, the policy of the contractor must include the following features:

First, the firm must offer plant and construction services that are consistent with the past reputation of the firm. It is essential for plant and construction firms to maintain and enhance their reputation if they are to be successful in overseas bidding.

Second, the firm should aim to identify its relative strengths and weaknesses in terms of actual construction and additional services offered, and continually aim to be competitive via the creation of new (and updating of existing) ownership advantages.

Third, the contractor should not necessarily try to compete in the market that has the greatest demand for plant and construction services if full exploitation of his advantages does not lie there.

Fourth, because demand is spasmodic, and the production base of the contractor is highly mobile, it may be beneficial for the contractor to operate in several markets using exporting and FDI simultaneously. By doing so, the contractor is diversifying the risk associated with international construction (political risk, fluctuating market demand, etc.) and also possibly utilising ownership advantages to a greater extent than operating in only one market.

Finally, contractors from the major developed countries should make more extensive use of joint ventures as a means of obtaining work on those contracts where it would be feasible for several firms to compete effectively as a single corporation on a contract.

CHAPTER 7

CONTEMPORARY PLANT AND CONSTRUCTION EXPORTS FROM KOREA

The main aim of this chapter is to examine macro and micro-economic aspects of the Korean economy which, coupled with the theoretical literature, are expected to help in accumulating a store of background knowledge for this study.

The chapter has five sections:

7.1 The contemporary Korean economy.

7.2 The status of plant exports and imports from Korea.

7.3 Contemporary Korean overseas' construction exports.

7.4 Problems associated with plant and construction exports from Korea.

7.5 Conclusion.

7.1 THE CONTEMPORARY KOREAN ECONOMY

This section, which presents and discusses the contemporary Korean economy, deals with the changes in real gross national products (GNP), the balance of payments and changes in consumer prices. These are followed by Korean projections for 1991.

7.1.1 THE CHANGE OF REAL GROSS NATIONAL PRODUCT

At the end of the 1950's Korea could hardly have been expected to achieve the outstanding development recorded during the First Five-Years (1962-1966) of the Socio-Economic Plan period. The republic entered the sixties with one of the lowest income levels in the world and, with little experience of international trade, its potential for rapid economic progress was not evident.

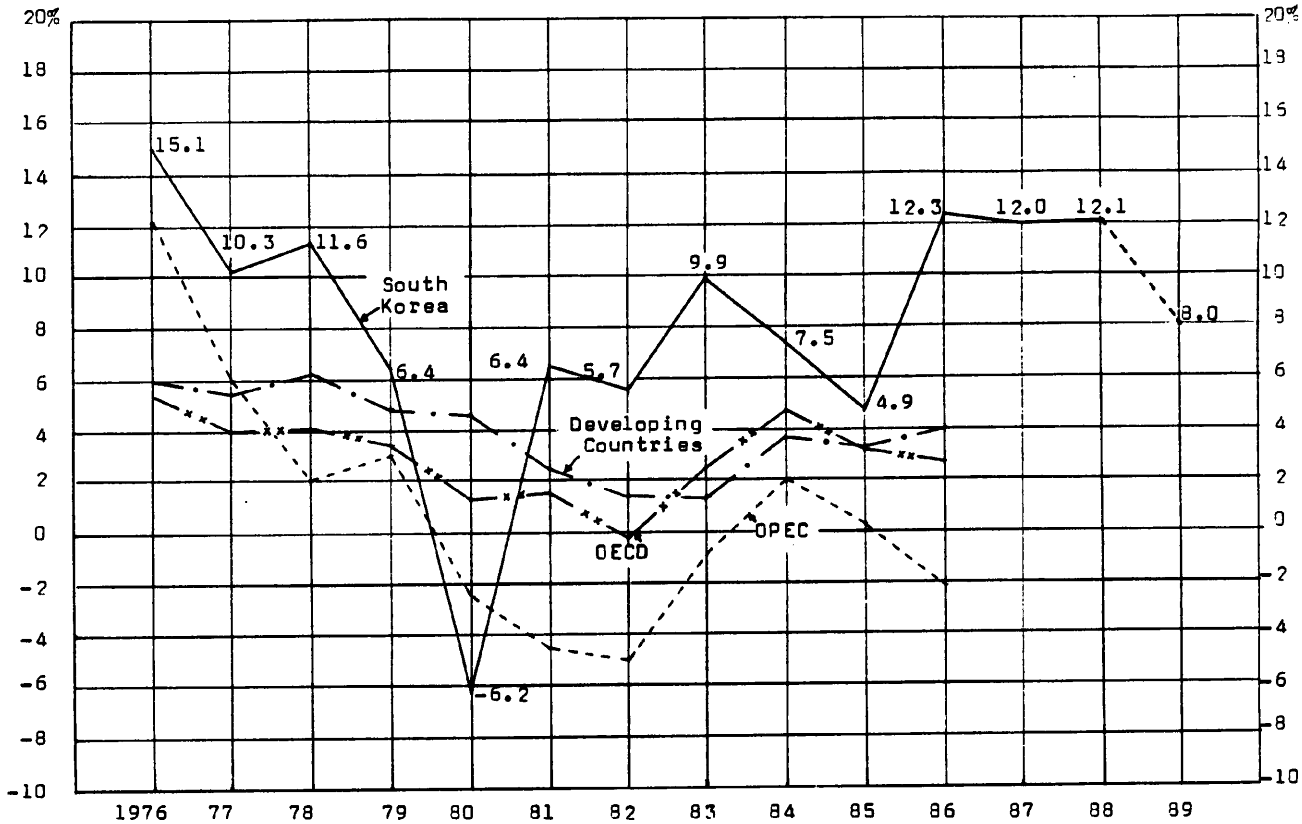
The change in the real gross national product (GNP, 1976-89) of Korea, compared with OPEC, developing countries and OECD, is presented in Graph 7.1. In the early 1960's Korea began a successful programme of industrial growth. During 1964-74 real GNP rose at an average annual rate of about 10.0 %, although annual growth rates ranged from as high as 16.5 % in 1973 to below 8.0 % during the following year. This latter phenomenon is explained by the effects of worldwide recession and the oil embargo which hit Korea in 1974.

To offset the impact of foreign upheavals, a series of Special Presidential Emergency Measures were initiated during that year designed to stabilise prices, strengthen export finance and generate employment. Despite these measures, rising oil and raw materials prices contributed to domestic inflation and a 27.0 % reduction in GNP. During this time the value of exports rose by 38.0 %, while imports increased 68.0 %. A small surplus on invisible trade was replaced by a deficit and the current-account balance-of-payments deficit soared to a record US $ 2.023 bn. Employment levels continued to rise through the mid-1974, but average monthly man-days in mining and manufacturing began to drop and, with them, the growth of industrial output. Overall, the domestic product increased 8.7 % in 1974, about half as much as in 1973.

GNP at constant prices grew at 11.6 % in 1978, and 6.4 % in 1979. In 1980, the oil price shock and the rise in world interest rates combined with a slowdown of international trading activity to severely undermine Korea's economic progress, resulting in a traumatic 6.2 %

Graph 7.1

The Change in Real Gross National Product (76 - 89)



Source: 1) IMF Annual Report, 1983, 1985, 1987.
2) In June Kim (1985), Asian Economics, June, p. 25.
3) The Economist, March 1, 1986.
4) Korea Newsreview, May 24, 1986, p. 9.
5) Korea Newsreview, December 17, 1988, p. 15.

Note: GDPs are indicated in OPEC and Developing Countries from 1983.

decline in GNP. Korea suffered inflation of 28.0 % (see Graph 7.3) and a current-account deficit of US $ 5.3 bn (see Table 7.1). Among the other traumas to afflict the country in 1980 were a disastrous rice harvest, an 80.0 % increase in the oil import bill (to US $ 5.58 bn) and severe political turmoil. Korea's economy at the end of 1981 was significantly strengthened, however, by tight monetary policies which helped bring inflation under control.

With its heavy dependence on imported oil and its export-led growth policies, Korea is considered by some to be extremely vulnerable in the international economy. However, Korea has a strong competitive advantage in light manufacturing and heavy industry. A recent poll by the Korea Foreign Trade Association (KFTA) has shown that Korean commodities are steadily regaining a competitive edge over their foreign counterparts in terms of price and quality (Korea Newsreview, June 20, 1987). According to the survey, 33.5 % of foreign buyers responded that Korean goods held a price advantage over their foreign counterparts, particularly those of Taiwan and Hong Kong, Korea's major trading rivals. The comparable percentage stood at 25.6 % in 1986 and 16.3 % in 1985, indicating that "made-in-Korea" products as a whole are maintaining their price competitiveness. However, the survey also claimed the Korean commodities faced a tide of protectionist moves abroad. To effectively overcome these trade barriers, the survey concluded that there is no alternative but to improve the competitive qualities of Korean goods. Government policies to bolster these qualities and to reduce some of the protection afforded to the private sector were coupled with increased attention to special policies, including tax treatment, greater equality of income and a higher investment ratio. These ambitious plans were to be financed by increased foreign borrowings and increased earnings by the export sector.

Sluggish growth of less than 5.0 % in 1985, increasing external debt service, and decreasing receipts in the sector of overseas construction led to higher unemployment just as the government began to face a serious political challenge from parliamentary and student opposition groups. Despite a currency devaluation in 1985, the volume of exports grew by only 3.5 %, the second smallest increase in twenty years (see Table 7.1).

As shown in Graph 7.1, the GNP growth rate has been 12.0 % or higher for the third consecutive year - 12.0 % in 1987 and 12.3 % in 1986. This high growth can be attributed to cheaper oil, a rising yen, robust exports and an expansion of domestic demand. Korea's 12.1 % GNP growth in 1988 compares with an estimated 3.8 % for the United States, 3.5 % for the European Community, 5.8 % for Japan, 6.0 % for Hong Kong, 7.25 % for Taiwan and 8.0 % for Singapore (Korea Newsreview, December 24, 1988). The nation's economic performance is impressive because it was achieved despite a sharp appreciation of the local currency and steep wage increases. In fact, workers' wages in all industries rose an average 15-16.0 % in 1988, surpassing the labour productivity growth rate, which was 10.9 % in the first half of 1988.

However, despite those difficulties, Korea is expected to record a relatively moderate economic growth of more than 8.0 % in 1989 and to reach the threshold of being designated an advanced country.

7.1.2 BALANCE OF PAYMENTS

The Korean balance of payments (1979-88) can be seen from Table 7.1 and Graph 7.2. The trade balance shows that since 1979 deficits were reduced to a near zero balance in 1985. The trend in the current account balance has been similar to that of the trade balance. The largest trade deficit, about US $ 4.4 bn, was recorded in 1979 and 1980 and the largest current account deficit, about US $ 5.3 bn, was in 1980.

TABLE 7.1

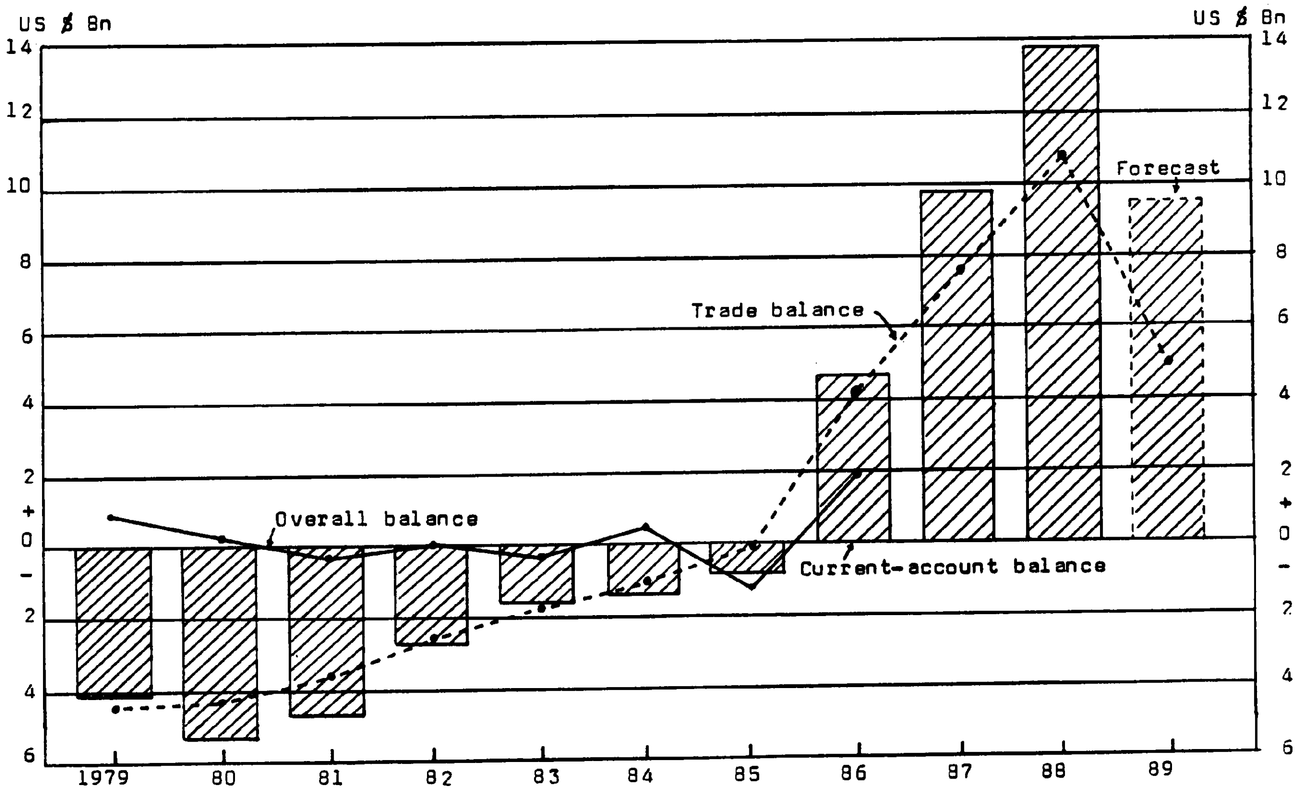
KOREAN BALANCE OF PAYMENTS (1979 - 1988)

Unit: US $ Million

Item \ Year	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Current account	-4,151	-5,321	-4,646	-2,650	-1,606	-1,371	-887	4,654	9,850	13,800
Trade balance	-4,395	-4,384	-3,628	-2,594	-1,763	-1,036	-19	4,255	7,650	10,800
Exports (fob)	14,705	17,214	20,671	20,879	23,204	26,335	26,442	33,881	46,250	59,300
Imports (fob)	19,100	21,598	24,299	23,473	24,967	27,371	26,461	29,626	38,600	48,500
Invisible trade balance	-195	-1,386	-1,519	-555	-435	-876	-1,446	-628	980	
Receipts	4,825	5,363	6,598	7,477	7,179	7,316	6,664	8,039		
Payments	5,020	6,749	8,117	8,032	7,614	8,192	8,110	8,667		
Unrequited transfers (net)	439	449	501	499	582	541	578	1,027	1,220	
Net long-term capital	3,071	1,987	3,637	1,797	1,791	2,923	1,101	-2,047		
Basic balance	-1,080	-3,334	-1,009	-853	185	1,552	214	2,607		
Net short-term capital	2,282	3,983	1,090	2,159	524	-113	-588	-409		
Errors & omissions	-328	-338	-410	-1,301	-945	-884	-880	-240		
Overall balance	874	311	-329	5	-236	555	-1,254	1,958		

Graph 7.2

KOREAN BALANCE OF PAYMENTS (1979 - 1989)



Source: 1) Korea Newsreview, May 17, 1986, Vol. 15, No. 20.
2) Korea Newsreview, January 31, 1987, Vol. 16, No. 5.
3) Korea Newsreview, January 9, 1988, Vol. 17, No. 2.
4) Korea Newsreview, December 24, 1988, Vol. 17, No. 52.
5) IMF, 1985 International Financial Statistics, Supplement on Economic Indicators.

These deficits were associated with the oil price shock, a rise in world interest rates, a slow-down in international trading activity, a disastrous rice harvest and severe political turmoil in 1980. However, since then, owing to a massive growth in earnings from overseas construction, in particular over US $ 13 bn in both 1981 and 1982, the invisible trade balance, which improved to about US $ 0.5 bn in 1982, contributed greatly to improvements in the current account balance and the basic balance. Nevertheless, the trend in the overall balance since 1980 has trended downwards under the influence of decreased net short-term capital movements and increased errors and omissions.

Despite a sharp fall-off in earnings on overseas construction since 1982, the current account balance moved into surplus for the first time in 1986, reaching US $ 4,654 million. Since then there has been a continuously improving trend in the surplus. The Bank of Korea has credited the improved current account to increased commodity exports, which have benefitted from appreciation of the Japanese yen, lower crude oil prices and falling international interest rates. Another factor behind the continuous export growth can be ascribed to the export industries' efforts to cope with currency appreciation by reducing both unit and prime costs and by technology innovation.

The growing surplus restored the government's confidence in its handling of the economy and several important measures were taken to promote sound growth. For example, the Korean government deregulated lending rates in December, 1988, opening up a new era of free competition in the financial sector which, despite the spectacular growth of the economy, is relatively underdeveloped. The Korean government also obtained article eight status with the International Monetary Fund, a step which requires full-scale foreign exchange liberalisation, thus enhancing the nation's standing in the world economic community. However, the Korean government is expected to respond positively to growing U.S. pressures for a more rapid appreciation of the won against dollar, the further opening of the domestic market and demands for the abolishment of various tariff barriers.

TABLE 7.2

BALANCE OF PAYMENTS

Unit: US $ million

Year	1988 (A)		1987 (B)		Change (A-B)	
Item	June	Jan-June	June	Jan-June	June	Jan-June
Current account	1,287	6,060	1,000	4,606	287	1,454
Trade balance	1,035	4,737	823	3,423	212	1,314
Exports	4,957	27,059	4,119	21,116	838	5,943
Imports	3,922	22,322	3,296	17,693	626	4,629
Invisible trade balance	145	490	82	655	63	-165
Receipts	959	5,282	904	5,009	55	278
Payments	814	4,792	822	4,354	-8	438
Unrequited transfer(net)	107	833	95	528	12	305
Net long-term capital	- 248	- 655	- 584	-1,666	336	1,011
Basic balance	1,039	5,405	416	2,940	623	2,465
Net short-term capital	- 76	581	- 207	- 319	131	900
Errors & omissions	155	720	154	- 194	1	914
Overall balance	1,118	6,706	363	2,427	755	4,279

Source: Korea Newsreview, July 30, 1988.

The balance of payments during the first six months of 1988 can be seen from Table 7.2. Overall, exports rose by 28.1 % to US $ 27,059 million, while total imports increased by 26.2 % to US $ 22,322 million over the same period in 1987. As a result, the total trade balance during the January-June period in 1988 registered a US $ 4,737 million surplus compared with a US $ 3,423 million surplus in the same period in 1987.

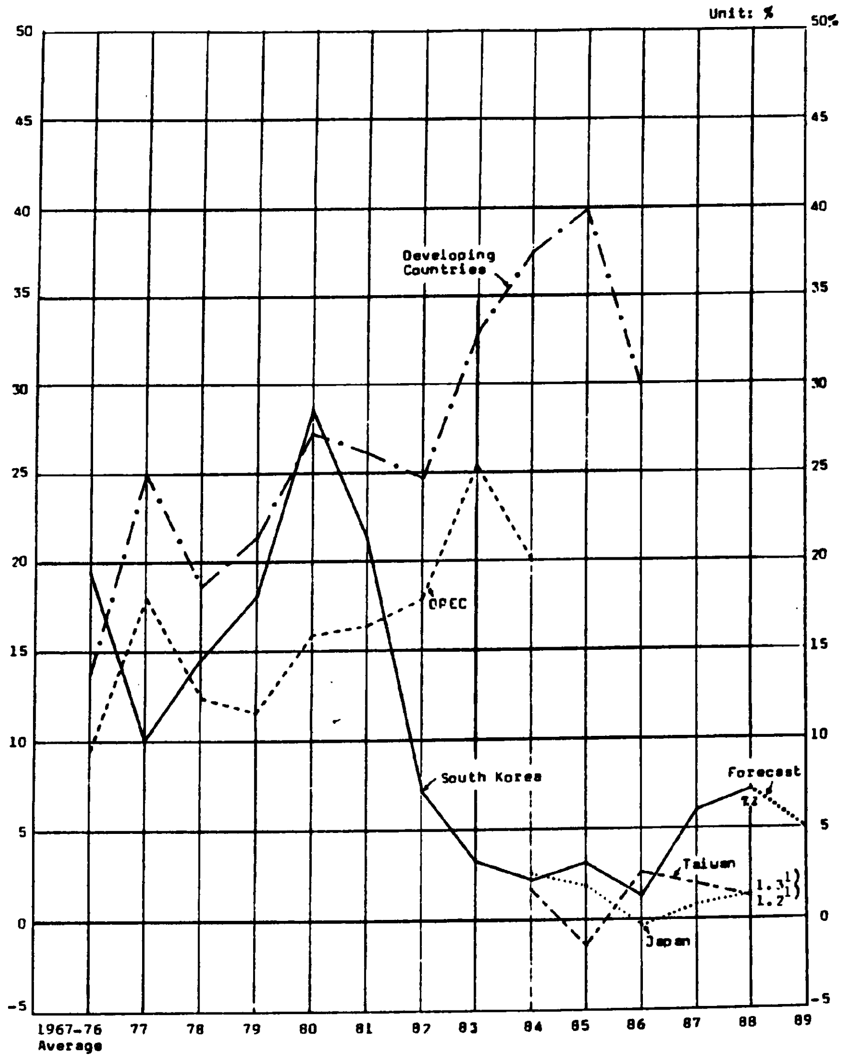
Although receipts from overseas construction were sharply reduced, the surplus in the invisible trade balance also increased, from US $ 82 million in June 1987 to US $ 145 million in the same month in 1988, mainly due to the favourable tourist receipts and reduced interest payments on foreign loans. This pushed the total current surplus in the first half of 1988 to US $ 6.06 bn.

7.1.3 THE CHANGE IN CONSUMER PRICES

Graph 7.3 shows the change in consumer prices since 1967. Mainly thanks to the high priority accorded to an anti-inflation policy by the Fifth Republic inaugurated in February 1981, the increase in consumer prices decreased from 28.1 % in 1980 to 21.0 % in 1981, to 7.4 % in 1982 and further to 3.5 % in 1983. From this graph, we observe that the sharp deceleration of inflation during 1982-86 was associated with a sharp reduction in the rate of growth of import costs and a slowdown in the rate of growth of agricultural prices. This price stability injected a fresh vigour into Korean production, exports and employment. However, since 1986 the consumer price index has shown a marked upward trend in consequence of: a) a sharp increase in the wage level (resulting from a settlement of labour management disputes); b) a marked growth of the total money supply (M2); and c) an increase in overseas raw material prices.

Graph 7.3

Change in Consumer Prices, 1967 - 89



Source: 1) IMF Annual Report, 1985, 1987.
2) Korea Newsreview, July 9, 1988.
3) The Joong-ang Daily News, January 6, 1989.

Note: 1) Taiwan, Japan of 1988: as of the end of November,1988.

7.1.4 PROJECTIONS FOR 1991

The Korean projections for 1991 are summarised in Table 7.3. The Korean government finalised a revision in July 1988 to the Sixth Five-Year (1987-91) Socio-Economic Development Plan. According to the revision, the Korean gross national product (GNP) is projected to grow by an annual average of 9.0 % in real terms from 1987 through 1991, with per capita GNP reaching US $ 5,500. In 1992, Korea's GNP is projected to reach US $ 280 bn with per capita GNP of US $ 6,200.

Major projections for the Sixth Five-Year Plan also presume a US $ 6 bn surplus in the current account in 1991 and a US $ 6 bn trade surplus. By 1991, Korea is expected to be ranked among the top 10 world trade partners, with two-way trade exceeding US $ 150 bn. In 1991, exports are predicted to stand at US $ 79.5 bn and imports at US $ 73.5 bn. To attain this goal, the policy will be to give priority to such high-tech industries areas as electronics, machinery and automobiles. Under the projections, Korea will become a creditor nation in 1991, with overseas assets outpacing foreign debt by US $ 3.5 bn.

In a move to ease trade friction with advanced countries and prevent excess liquidity in the overseas sector, the plan also calls for increased imports. Thus, the new plan projects that exports and imports will grow at an annual average rate of 18.0 % and 19.4 %, respectively, during the five-year period. In an effort to attain these targets, the Korean government will encourage industries, notably high-tech sectors, to invest in intensive technology techniques. Under the Sixth Five-Year Plan, the investment ratio will be raised to a level equivalent to 5.0 % of the GNP by 1991, compared with 2.0 % in 1986. To finance this investment, the Korean government will attempt to increase the domestic savings ratio to 33.5 % in 1991 from 28.4 % in 1985. Under the plan, annual average inflation rates are projected at around 3.0 % for wholesale prices and about 5.0 % for consumer prices.

The optimistic projections for price movements are based on the expectation of stable crude oil prices and parity between the Korean won and foreign currencies and international interest rates.

TABLE 7.3

SIXTH FIVE-YEAR PLAN

Item	Unit	1987	1991
Real GNP growth rate	%	12.0	7.5
GNP	$ billion at current prices	118.6	240.0
Per capita GNP	$ at current prices	2,826	5,500
Total investment ratio		29.8	31.6
Domestic savings ratio	%	35.6	33.5
Overseas savings ratio		-6.4	-2.0
Current account		9.8	6.0
Trade balance		7.7	6.0
Exports	$ billion	46.3	79.5
Imports		38.6	73.5
Invisible trade balance		0.9	0
Unrequited transfer(net)		1.2	0
Outstanding foreign debt		35.6	23.0
Overseas assets	$ billion	13.2	26.5
Net foreign debt		22.4	-3.5

Source: Korea Newsreview, April 16, 1988, August 6, 1988, and December 24, 1988.

7.1.5 IMPLICATIONS

Today Korea is strongly committed to the pursuit of high economic growth and a greater role in the international economy within a free-market framework. The growth objective is considered necessary to support a forecast 1.5 % per annum increase in Korea's labour force during the next ten years, in real terms a half-million addition to the labour force. To create enough jobs for these new workers, Korea requires an annual economic growth rate of at least 5-6 %. In spite of the economic progress of the last 25 years, Korea's per capita GNP is still one-fourth to one-fifth of that typically prevailing in industrially advanced nations. Furthermore, Korea allocates a minimum of 5-6.0 % of its GNP to defence. To meet this defence requirement without sacrificing consumption, Korea needs high economic growth.

It is inevitable that the Korean government will be required to increase the tax burden of the people to expand social welfare programmes such as a national pension system, a pan-national medical insurance system and the construction of more rental housing units.

Korea's current account surplus is expected to continue in the absence of major external shocks, but it will be constrained by the proportionally stronger pressures and barriers of various kinds from the developed countries as well as the needs for investment and consumption growth. The balance is also vulnerable to other external events, so that any favourable structural or fundamental trend in the external balance could be easily swamped by a relatively minor aggravation of the terms of trade.

7.2 THE STATUS OF PLANT EXPORTS AND IMPORTS

This section, which presents and discusses the status of plant exports and imports from Korea, deals with: a) the change in plant exports and imports as recorded by the SITC (Standard International Trade Classification) method; b) the change in general plant exports on a permission basis; and c) a SITC comparison of export trends between developed and newly industrialised countries.

7.2.1 THE CHANGE IN PLANT EXPORTS AND IMPORTS BY THE SITC METHOD

The Standard International Trade Classification (SITC) is useful for comparing the trend and structure of plant exports between the developed countries and NICs, except that it does not break down the statistics related to plant exports from Japan and South Korea. The SITC data on industrial plant includes machinery and tools, which in the case of Korea are excluded by virtue of a law which merely identifies and classifies industrial plant suitable for export promotion. In addition, the calculated value of permissible plant exports as estimated by the Ministry of Trade and Industry (a formal total) is based on the contract date, whereas the SITC method is based on the customs clearance date. As a result, the value of plant exports using the SITC method is relatively larger than the calculations of the Korean Ministry of Trade and Industry.

Table 7.4 shows the change in general plant exports from Korea according to the SITC classification from 1982-86. The sharp increase in plant exports from 1982 to 1983 can be attributed to active governmental support through a law promoting industrial plant exports (enforced on December 5th, 1978). As can be seen from Table 7.4, the annual growth rate (18.5 %) of plant exports from 1982 to 1986 surpassed that of total exports (12.7 %), and the ratio of plant exports to total exports marginally increased from 6.6 % in 1982 to 7.9 % in 1986. In contrast, the ratio of plant exports to machinery exports in 1986 was almost the same as that of 1982.

TABLE 7.4

The Change in General Plant Exports from Korea (1982-86)
(SITC Classification Method)

Unit: US $ Million, %

Item \ Year		1982	1983	1984	1985	1986	Annual Growth Rate
Plant Export (A)		1,436	1,959	1,931	2,405	2,753	18.5
Machinery Exports (B)		6,228	8,532	10,978	12,079	12,126	19.0
Total Exports (C)		21,616	24,437	29,248	30,283	34,714	12.7
Share Ratio (%)	1) A/B	23.1	23.0	17.6	19.9	22.7	0.8
	A/C	6.6	8.0	6.6	7.9	7.9	7.8

Source: UN Yearbook of International Trade Statistics, 1983, 1986.
Note : 1) SITC (7 + 6911), Revision II.

Table 7.5 shows the change in plant exports by product type in Korea from 1982-86. Although the value of general plant exports in 1986 was nearly double that of 1982, the ratio of plant exports to total exports (7.9 % in 1986) was less than half of that of Japan (21.6 % in

TABLE 7.5

The Change in General Plant Exports in Korea (1982 - 1986)

Unit: US $ Million

Year / Production Classification	1982		1983		1984		1985		1986		Average Growth Rate per annum (%)		
	value	%	value	%	value	%	value	%	value	%	82-84	84-86	82-86
Total Exports	21,616	100	24,437	100	29,248	100	30,283	100	34,714	100	16.4	9.1	12.7
General Plant Total	1,436	(6.6) 100	1,959	(8.0) 100	1,931	(6.6) 100	2,405	(7.9) 100	2,753	(7.9) 100	18.2	19.5	18.9
Railway Vehicles	53	(3.7)	53	(2.7)	34	(1.8)	21	(0.9)	36	(1.3)	-17.9	16.6	-0.7
Aircraft Etc	56	(3.9)	85	(4.3)	148	(7.7)	249	(10.4)	308	(11.2)	63.0	34.2	48.6
Other General Plant	1,328	(92.5)	1,821	(93.0)	1,749	(90.6)	2,135	(88.8)	2,409	(87.5)	18.5	17.5	18.0
Power Machinery Non-Elec	89	6.2	89	4.5	136	7.0	187	7.8	161	5.8	26.4	11.8	19.1
Agricultural Machinery	4	0.3	6	0.3	5	0.3	2	0.1	5	0.2	16.7	45.0	30.9
Textile & Leather Machinery	34	2.4	26	1.3	35	1.8	34	1.4	40	1.5	5.6	8.8	7.2
Metalworking Machinery	44	3.1	31	1.6	26	1.3	29	1.2	42	1.5	-6.7	28.2	10.8
Machines for Special Industries	57	4.0	184	9.4	62	3.2	68	2.8	105	3.8	78.3	32.1	55.2
Machines NES Non-Elec	140	9.7	119	6.1	141	7.3	226	9.4	304	11.0	1.8	8.8	5.3
Elec Power Mach, Switchgear	174	12.1	211	10.8	263	13.6	265	11.0	315	11.4	23.0	9.9	16.4
Electr Distributing Machinery	120	8.4	137	7.0	99	5.1	94	3.9	132	4.8	-6.8	17.7	5.4
Telecommunication Equipment NES	289	20.1	466	23.8	457	23.7	529	22.0	837	30.4	29.7	37.0	33.4
Structures, Parts Iron, Steel	376	26.2	552	28.2	525	27.2	701	29.1	468	17.0	21.0	0.2	10.6

Source: UN; Yearbook of International Trade Statistics, 1983, 1986.

1986, see Table 7.14), implying that Korea still has some way to go before matching Japan's success in penetrating global markets in this highly technology intensive industry. An average growth rate per annum for aircraft of 48.6 % demonstrates that Korea probably possesses a stronger international competitive advantage than her foreign counterparts in terms of price and quality (particularly Taiwan, Eastern-European countries and Brazil, Korea's major trading rivals in aircraft).

The change in other general plant exports (excluding railway vehicles and aircraft) is as follows: In 1982 the ratio of structural installation exports of iron and steel to total general plant exports was the highest (26.2 %) and telecommunication equipment exports (20.1%) was the second highest. For the three consecutive years these two products also maintained first and second place. In 1986 telecommunication equipment replaced iron and steel in first place and the gap between structural installation and electrical power machinery and switchgear was considerably narrowed. Together, the exports of the above three products accounted for over half of total plant exports. However, the export value of metalworking machinery, which can be considered as a barometer of the machine industry, was only US $ 42 million in 1986 and accounted for just 1.5 % of total plant exports.

The data in Table 7.6, which shows the change in general plant imports to Korea, is introduced to compare export performance against the propensity to import comparable products. It can be seen from this table that the ratio of general plant imports (including railway vehicles and aircrafts) to total imports was about 16.0 % in 1982, 1983, 1984 and 1985 and about 21.0 % in 1986. An export-import ratio of 1:3

TABLE 7.6

The Change in General Plant Imports to Korea (1982 - 1986)

Unit: US $ Million

Year / Production Classification	1982		1983		1984		1985		1986		Average Growth Rate per annum (%)		
	value	%	value	%	value	%	value	%	value	%	82-84	84-86	82-86
Total Imports	24,251	100	26,174	100	30,609	100	31,119	100	31,518	100	12.4	1.5	7.0
General Plant Total	4,003	(16.5) 100	3,859	(14.7) 100	4,691	(15.3) 100	4,862	(15.6) 100	6,688	(21.2) 100	9.0	20.6	14.8
Railway Vehicles	31	(0.8)	31	(0.8)	31	(0.7)	17	(0.3)	26	(0.4)	0	3.9	1.9
Aircraft Etc	73	(1.8)	149	(3.9)	301	(6.4)	369	(7.6)	559	(8.4)	103.1	37.1	70.1
Other General Plant	3,899	(97.4)	3,679	(95.3)	4,359	(92.9)	4,475	(92.0)	6,103	(91.3)	6.5	19.6	13.0
Power Machinery Non-Elec	588	14.7	488	12.6	628	13.4	565	11.6	605	9.0	5.9	-1.5	2.2
Agricultural Machinery	421	10.5	27	0.7	25	0.5	17	0.3	15	0.2	-50.5	-32.0	-36.2
Texttile & Leather Machinery	238	5.9	212	5.5	247	5.3	211	4.3	302	4.5	2.8	14.3	8.5
Metalworking Machinery	153	3.8	214	5.5	238	5.1	360	7.4	660	9.9	25.6	67.3	46.5
Machines for Special Industries	416	10.4	524	13.6	663	14.1	782	16.1	978	14.6	26.3	21.5	23.9
Machines NES Non-Elec	947	23.7	950	24.6	1,154	24.6	1,239	25.5	1,692	25.3	10.9	22.0	16.5
Elec Power Mach, Switchgear	486	12.1	523	13.6	644	13.7	651	13.4	1,068	16.0	15.4	32.6	24.0
Electr Distributing Machinery	48	1.2	65	1.7	73	1.6	78	1.6	101	1.5	23.9	18.2	21.0
Telecommunication Equipment NES	564	14.1	638	16.5	614	13.1	545	11.2	658	9.8	4.7	4.8	4.7
Structures, Parts Iron, Steel	39	1.0	38	1.0	73	1.6	28	0.6	25	0.4	44.8	-36.2	4.3

Source: UN; Yearbook of International Trade Statistics, 1983, 1986.

in 1982 was reduced to 2:5 in 1986. The relatively high ratio in 1982 stems from a full-scale drive to implement a heavy chemical industrialisation policy and a radical increase in installation investment. Since then, the rate of growth of this investment phenomenon has decelerated.

In the case of railway vehicles, an export-import ratio of 9:5 in 1982 and 1983 was reduced to 7:6 in 1985, followed by a slight recovery in 1986. In the case of aircraft, the export-import ratio has been more severe than for railway vehicles since 1983. The major ranking of general plant imports by machinery type in 1982 was non-electric machines, non-electric power machinery and telecommunication equipment. In 1985 the order was non-electric machines, machines for special industries and electric power machines and switchgear. The order in 1986 was non-electric machines, electric power machines and switchgear and machines for special industries. It is worthy of mention that there was a large increase in the trend in imports of machines associated with the heavy chemical industry, in particular metalworking machinery, electric power machines and switchgear and machines for special industries. In 1986 the only machinery types for which the export value exceeded the import value were the structural installation of iron and steel, electric distributing machinery and telecommunication equipment.

As can be seen from Table 7.7, the ratio of machinery exports to total exports marginally increased until 1985 and the heavy chemical exports ratio also gradually increased until 1985. However, in 1986 both the machinery exports ratio and the heavy chemical exports ratio markedly decreased. The ratio of general plant exports to machinery

TABLE 7.7

Export Value by Principal Products of Korea (1983 - 1986)

Unit: US $ Million, %

Product \ Year	1983	%	1984	%	1985	%	1986	%
A. Total Exports	24,437	100	29,248	100	30,283	100	34,714	100
B. Industrial Product	22,341	91.4	26,782	91.6	27,770	91.7	32,012	92.2
C. Light Industrial Product	10,294	42.1	11,887	40.6	12,004	39.6	15,753	45.4
D. Heavy Chemical Product	12,047	49.3	14,895	50.9	15,766	52.1	16,259	46.8
D-1 Metal	2,838	11.6	3,070	10.5	2,751	9.1	3,064	8.8
D-2 Chemical Product	677	2.8	847	2.9	936	3.1	1,069	3.1
D-3 Machinery	8,532	34.9	10,978	37.5	12,079	39.9	12,126	34.9
E. Heavy Machinery among Machinery	5,843	23.9	6,907	23.6	8,123	26.8	6,120	17.6
Plant Export	5,694	23.3	6,614	22.6	7,445	24.6	4,568	13.2
Ships & Boats	3,735	15.3	4,683	16.0	5,040	16.6	1,815	5.2
General Plant	1,959	8.0	1,931	6.6	2,405	7.9	2,753	7.9
Road Motor Vehicles	149	0.6	293	1.0	678	2.2	1,552	4.5
F. Light Machinery	2,689	11.0	4,071	13.9	3,956	13.1	6,006	17.3
Heavy Chemical Exports Ratio (D/A)	49.3		50.9		52.1		46.8	
Machinery Exports Ratio (D-3/A)	34.9		37.5		39.9		34.9	
General Plant Exports Ratio (General Plant/A)	8.0		6.6		7.9		7.9	
General Plant/D-3[1)]	23.0		17.6		19.9		22.7	

Source: UN; Yearbook of International Trade Statistics, 1986.

Note: 1) SITC (7+6911)

exports markedly decreased in 1984, but since then has gradually increased. Contributing factors include: a) a severe stagnation in the ship and boat building industry in 1986, b) a marginal decrease in general plant exports in 1984; and c) a gradual increase in general plant exports from 1985.

7.2.2 THE CHANGE IN GENERAL PLANT EXPORTS ON A PERMISSION BASIS

The change in general plant exports (1982-1987) on a "statistics of permission" basis is presented in Table 7.8. During 1982-87 plant exports dropped at an average annual rate of 7.8 %. In contrast, machinery exports and total exports rose at an average annual rate of 21.7 % and 17.4 %, respectively. The sharp decrease of general plant exports since 1986 can be attributed to a depressed market for plant construction resulting from a decline in oil prices in the Middle-East, which shares 70.0 % to 80.0 % of total orders. In fact, Korean plant exporters failed in their bid to capture a major contract associated with a large-sized ocean oil production installation, which would have made a significant contribution to plant export performance. As a result, the value of plant exports in 1986 dropped markedly to US $ 627 million. In response, to minimise the likelihood of such sudden decreases in plant exports, it can be argued that the Korean government should consider the merits of a market diversification policy.

Table 7.9 shows the change in general plant exports by item from 1981-87. In 1984 the favourable items were ocean-oil production installation, sea-water desalinising installation, storage installation, and construction transport, loading and unloading installation. The

TABLE 7.8

The Change in General Plant Exports from Korea (1982 - 1987)
(Statistics of Plant Exports permissible by a Law Bases)

Unit: US $ Million, %

Item / Year		1982	1983	1984	1985	1986	1987	Annual Growth Rate
Plant Exports (A)		1,036	1,318	1,068	1,388	627	487	-7.8%
Machinery Exports (B)		7,654	9,331	12,162	13,935	13,973	19,748	21.7%
Total Exports (C)		21,616	24,223	29,179	30,283	34,714	47,281	17.4%
Share	A/B	13.5	14.1	8.8	10.0	4.5	2.5	-23.8%
Ratio	A/C	4.8	5.4	3.7	4.6	1.8	1.0	-20.0%

Source: A Trend of Industrial Plant Exports, Korea Society for the Advancement of Machine Industry (KOSAMI), May 18, 1988.

weak items, electric and manufacturing installations, were adversely affected by cut-backs in importing countries' development plans and by delays in new orders from the Middle-East countries following the decline in oil prices. In 1985 the major export items to South-East Asian and African developing countries (such as electric installation, storage installation, and construction transport, loading and unloading installation) were reduced as the debt crisis began to impede the ability of countries to raise new loans. In contrast, exports of ocean-oil production installation to the United States increased. In 1986 and 1987 exports of ocean-oil production installations, which have been the most favourable item since 1981, sharply reduced to about US $ 180 million, accounting for only 28.9 % of total plant exports. Since 1986

TABLE 7.9

The Change in General Plant Exports by Item in Korea (1981 - 1987)

Unit: US $ Million, %

Year / Item	1981	1982		1983		1984			1985			1986			1987		
	value	value	% change	value	% change	No of cases	value	% change	No of cases	value	% change	No of cases	value	% change	No of cases	value	% change
Total	950 (100)	1,037 (100)	109	1,318 (100)	127	94	1,068 (100)	81	89	1,388 (100)	130	117	627 (100)	45	61	487 (100)	78
Electric Installation	34 (3.6)	64 (6.2)	192	286 (21.7)	443	22	195 (18.3)	68	30	69 (5.9)	35	41	106 (16.9)	154	18	93 (19.1)	88
Manufacturing Installation	38 (4.0)	362 (34.9)	955	424 (32.2)	117	10	26 (1.9)	6	12	39 (2.8)	150	27	144 (23.0)	369	13	34 (7.0)	24
Structures, Parts of Iron and Steel	33 (3.5)	88 (8.5)	267	28 (2.1)	32	28	54 (4.9)	194	21	92 (6.6)	168	24	48 (7.6)	52	12	41 (8.4)	85
Ocean Oil Production Installation	787 (82.8)	359 (34.6)	46	523 (39.7)	146	14	661 (61.9)	126	10	1,021 (73.6)	154	8	181 (28.9)	18	2	170 (35.0)	94
Sea Water Desalinising Installation	27 (2.8)	88 (8.5)	327	0.4 (-)	5	1	22 (2.0)	5,403	1	119 (8.6)	549	1	88 (14.0)	74	-	-	-
Storage Installation	22 (2.3)	6 (0.6)	26	31 (2.3)	537	6	47 (4.4)	154	8	25 (1.8)	52	3	13 (2.1)	52	-	-	-
Construction Transport, Loading & Unloading Installation	10 (1.1)	68 (6.5)	162	13 (1.0)	20	8	41 (3.8)	303	4	10 (0.7)	24	5	29 (4.6)	290	6	88 (18.0)	303
Other	-	2 (0.2)	1	13 (1.0)	526	5	22 (2.0)	178	3	13 (0.9)	59	8	18 (2.9)	139	10	61 (12.5)	339

Source: The Status of Plant Exports, The Ministry of Trade and Industry, Seoul Korea, January 1985, 1986, 1988.
Note: ( ) Share Ratio.

Korean plant exporters have failed to receive a single order associated with sea water desalinising installation and storage installation.

The change in general plant exports by region can be seen from Table 7.10. Korea's most important market was America in 1981, Asia in 1982, the Middle-East in 1983 and Asia again in 1984. From 1982 to 1984 Asia and the Middle-East markets shared 72.4 % to 97.7 % of total plant exports from Korea, in particular Malaysia (except for 1983) and Saudi-Arabia (except for 1984). In 1984 Korea's dependence on the Middle-East reduced dramatically from 74.4 to 30.3 %, in particular on Saudi-Arabia (from 29.1 % down to 0.7 %). A sharp decrease in general plant exports to Saudi-Arabia contributed to a marked decrease in total plant exports from Korea, again in consequence of declining development expenditure (in the wake of falling oil prices) in the Middle-East.

In 1985 a substantial change took place in the American market, where Korean exports by value increased to US $ 1,018 million from US $ 200 million, and market share to 73.3 % of total exports (up from 18.7 %). Most of the new demand was for ocean-oil production installations which Korea entered as part of a market diversification policy. Thus, Korea's dependence on Asia and the Middle-East decreased respectively to 9.8 % (from 42.1 %) and 11.5 % (from 30.3 %).

In 1986 and 1987 Asia, in particular India, was the most important market to Korean plant exporters, while Saudi-Arabia was the most unfavourable. This combination arose from a governmental policy which promoted small and medium-sized plant exports to the South-East and South-West Asian market and encouraged Korean contractors to capture these markets be entering into collaborative agreements with partners from Asian countries. An emerging trend has been increased price

TABLE 7.10

The Change in General Plant Exports by Region in Korea (1981 - 1987)

Unit: US $ Million, %

Region \ Year	1981	1982		1983		1984			1985			1986			1987		
	value	value	% change	value	% change	No of cases	value	% change	No of cases	value	% change	No of cases	value	% change	No of cases	value	% change
Total	950 (100)	1,037 (100)	109	1,318 (100)	127	94	1,068 (100)	81	89	1,388 (100)	130	117	627 (100)	45	61	487 (100)	78
Asia	124 (13.1)	558 (53.8)	450	307 (23.3)	55	40	450 (42.1)	147	38	136 (9.8)	30	70	276 (44.0)	203	35	377 (77.4)	137
Indonesia		45	177	10	22	5	17	213	8	62	375	10	34	55	5	11	32
India		-	-	-	-	-	-	-	-	-	-	16	141	470	5	258	183
Malaysia		198	262	52	26	11	118	229	5	9	7	7	40	444	1	0.7	2
Other		315	1,370	245	78	24	415	169	25	65	16	37	61	94	24	107	176
Middle-East	83 (8.7)	404 (39.0)	487	980 (74.4)	243	23	324 (30.3)	33	14	160 (11.5)	49	18	252 (40.2)	158	2	2 (0.4)	1
Saudi-Arabia		264	680	384	145	8	7	2	5	127	1,723	2	-	-	-	-	-
Other		140	179	596	426	15	317	53	9	33	10	16	251	761	2	2	1
Western Europe	96 (10.1)	0.4 (-)		-	-	2	92 (8.6)	-	3	74 (5.4)	81	-	-	-	-	-	-
America	628 (66.1)	31 (3.0)	5	29 (2.2)	95	27	200 (18.7)	691	32	1,018 (73.3)	508	23	51 (8.1)	5	23	108 (22.2)	212
Oceania	11 (1.2)	22 (2.1)	201	2 (0.2)	7	1	0.9 (0.1)	61	-	-	-	2	3 (0.5)	-	-	-	-
Africa	8 (0.8)	21 (2.0)	277	0.7 (0.1)	3	1	0.5 (-)	74	-	-	-	4	45			0.4	

Source: See Table 7.9.
Note: ( ) Share Ratio.

competition from low-wage developing countries such as Pakistan, Malaysia, India and the Republic of China.

Table 7.11 shows the change in general plant exports by contract size from 1981-87. In 1984 the overall average value per number of cases reduced to US $ 11.4 million from US $ 14.2 million, largely attributable to a lack of orders for large manufacturing installations over US $ 100 million. The demand for other contract sizes increased, except for contracts below US $ 1 million as compared with 1983. However, in 1985 the overall average value per number of contracts increased to US $ 15.6 million (from US $ 11.4 million in 1984), largely due to a favourable single order for a large-scale ocean-oil production installation. In 1986 and 1987 the overall average value per number of contracts sharply reduced to US $ 5.4 million and US $ 8.0 million, respectively (from US $ 15.6 million in 1985), in consequence of low demand for large-scale ocean-oil production installations.

The change in general plant exports by contract execution period is presented in Table 7.12. In 1984 plant exports of long-term installations in excess of two years were reduced, in reflection of Korea's failure to contest successfully in this market. Installations exports below two years, however, increased. In 1985 there was a recovery in the export of installations over three years, but exports in this sector steeply reduced to US $ 107 million in 1986.

Table 7.13 shows the change in general plant exports by transaction condition from 1982-1987. In 1985 exports on D/A (document against acceptance), D/P (document against payment), and on deferred payments' all increased due to a large increase in the nominal size of contracts

TABLE 7.11

The Change in General Plant Exports by Contract Size in Korea (81 - 87)

Unit: US $ Million, %

Year / Size	1981	1982		1983		1984			1985			1986			1987		
	value	value	% change	value	% change	No of cases	value	% change	No of cases	value	% change	No of cases	value	% change	No of cases	value	% change
Total	946 (100)	1,037	109	1,318 (100)	127	94	1,068 (100)	81	89	1,388 (100)	130	117	627 (100)	45	61	487 (100)	78
Average per Number of Cases	11.0	9.7	88	14.2	146		11.4	80		15.6	137		5.4	35		8.0	148
below US $ 1 million	19 (2.0)	22 (2.2)	117	18 (1.4)	82	21	13 (1.2)	70	30	18 (1.3)	138	44	28 (4.5)	156	12	7 (1.5)	25
1 - 5 million	64 (6.8)	115 (11.1)	179	89 (6.8)	77	44	99 (9.3)	111	37	96 (6.9)	97	48	106 (16.9)	110	27	48 (9.9)	45
5 - 10 million	36 (3.8)	85 (8.2)	217	44 (3.3)	52	10	68 (6.3)	154	7	53 (3.8)	78	12	78 (12.4)	147	13	78 (16.0)	100
10 - 50 million	111 (11.7)	140 (13.5)	126	100 (7.6)	72	12	245 (23.0)	245	8	112 (8.1)	46	11	231 (36.8)	206	4	77 (16.0)	33
50 - 100 million	426 (45.0)	223 (21.5)	52	142 (10.8)	64	5	350 (32.2)	247	3	227 (16.4)	65	2	184 (29.4)	81	3	157 (32.3)	85
Over 100 million	290 (30.7)	452 (43.5)	156	924 (70.1)	205	2	293 (27.4)	32	4	881 (63.5)	300	-	-	-	1	118 (24.3)	-

Source: The Status of Plant Exports, The Ministry of Trade and Industry, Seoul Korea, January 1986, 1988.

Note: ( ) Share Ratio.

TABLE 7.12

The Change in General Plant Exports by Execution Period in Korea (1980 - 1986)

Unit: US $ Million, %

Year / Execution Period	1980	1981		1982		1983			1984			1985			1986		
	value	value	% change	value	% change	No of cases	value	% change	No of cases	value	% change	No of cases	value	% change	No of cases	value	% change
Total	522 (100)	946 (100)	181	1,037 (100)	109	93	1,318 (100)	127	94	1,068 (100)	81	89	1,388 (100)	130	117	627 (100)	45
below 6 months	24 (4.6)	17 (1.8)	71	66 (6.3)	377	28	27 (2.0)	41	37	50 (4.7)	187	31	31 (2.2)	62	50	57 (9.1)	184
6 months - 1 year	61 (11.6)	98 (10.4)	160	351 (33.9)	356	33	82 (6.2)	23	27	197 (18.4)	240	21	61 (4.4)	31	39	149 (23.7)	244
1 -2 year	292 (55.9)	637 (67.3)	218	252 (24.3)	39	26	316 (24.0)	125	21	332 (31.1)	105	26	357 (25.7)	107	18	183 (29.2)	51
2 - 3 year	146 (27.9)	194 (20.5)	133	118 (11.4)	61	4	321 (24.4)	273	6	175 (16.4)	55	5	129 (9.3)	74	8	131 (20.9)	101
Over 3 year	-	-	-	250 (24.1)	-	2	572 (43.4)	229	3	314 (29.4)	55	6	810 (58.4)	258	2	107 (27.1)	13

Source: 1) The Status of Plant Exports, The Ministry of Trade and Industry, Seoul Korea, January 1985, 1986.

2) The Report of Policy Explanatory Meeting for Promoting the Industrial Plant Exports, Korea Society for the Advancement of Machine Industry (KOSAMI), February 1987.

Note: ( ) Share Ratio.

TABLE 7.13

The Change in General Plant Exports by Transaction Condition in Korea (1982 - 1987)

Unit: US $ Million, %

Year / Transaction Conditions	1982			1983			1984			1985			1986			1987		
	No of cases	value	% change	No of cases	value	% change	No of cases	value	% change	No of cases	value	% change	No of cases	value	% change	No of cases	value	%
Total	107	1,037 (100)	109	93	1,318 (100)	127	94	1,068 (100)	81	89	1,388 (100)	130	117	627 (100)	45	61	487 (100)	78
L/C[1)]	50	93 (9.0)	169	50	96 (7.2)	102	40	121 (11.3)	127	38	88 (6.3)	73	44	60 (9.6)	68	26	96 (19.7)	160
D/A, D/P	11	28 (2.7)	137	4	14 (1.1)	49	7	13 (1.2)	92	9	29 (2.1)	223	13	30 (4.9)	103	5	16 (3.3)	53
T/T[2)]	-	-	-	NA	241 (18.3)	-	17	243 (22.8)	99	21	182 (13.1)	75	32	235 (37.5)	129	-	-	-
P/P[3)]	-	-	-	2	30 (2.2)	-	4	29 (2.8)	99	3	10 (0.7)	34	-	-	-	-	-	-
Mixed Basis (L/C, T/T, P/P)	40	708 (68.3)	110	28[4)]	763 (57.9)	108	17	314 (29.4)	56	14	298 (21.5)	95	24	182 (29.0)	61	30	375 (77.0)	206
Deferred Payment Basis	6	207 (20.0)	89	9	175 (13.3)	85	9	347 (32.5)	198	4	781 (56.3)	225	4	119 (19.0)	15	-	-	-

Source: See Table 7.12. The Reports of Policy Explanatory Meeting for Promoting the Industrial Plant Exports, KOSAMI, February 20, 1987 and April 29, 1988.

Note: 1) L/C means 'letter of credit', 2) T/T means 'telegraphic transfer' from a bank instructing an agent, branch or correspondent in another country to pay a specified sum of money to someone, 3) P/P means 'post-payment, and 4) The number includes the number of cases in T/T.

(resulting from the accelerated general inflation of prices) for plant exports and to a worsening shortage of foreign exchange in the importing countries. For Korea to achieve a competitive edge in exports on deferred payments on long or mid-term periods, attempts should be made to finance such credits from an increase in Korea's domestic savings ratio or from foreign loans. An important consideration in the case of deferred payment contracts must be an awareness of political risks giving rise to contract default. In fact, the value of contract default in overseas construction exports largely in the Middle-East and South-East Asia was over US $ 2.2 billion by the end of 1985.

In 1986 exports on deferred payments were sharply reduced to US $ 119 million, accounting for only 19.0 % of total plant exports, while exports on T/T (telegraphic transfer) were increased, largely due to an export growth of small and medium-sized installations. In 1987 exports on a mixed basis (L/C, T/T, and P/P) greatly increased to US $ 375 million, showing that most plant exports were transacted under this arrangement.

7.2.3 EXPORT TRENDS BETWEEN INDUSTRIAL AND NEWLY INDUSTRIALISED COUNTRIES

Table 7.14 offers an international comparison of general plant exports between the developed countries and NICs. The value of general plant exports from Korea in 1978 was US $ 727 million, equivalent to 3.8 % of exports from Japan and 48.8 % of exports from Spain, but this value was the second largest after Brazil amongst the NICs. However, in 1986 Korea's general plant exports were the lowest by value except for Spain

TABLE 7.14

International Comparison of General Plant Exports between the Developed and NICs

(SITC Classification Method)

Unit: US $ Million, %

Country \ Item / Year	Value			General Plant/ Total Exports			General Plant/ Machinery[1]		
	1973	1978	1986	1973	1978	1986	1973	1978	1986
United States	28,116	29,983[2]	51,520	23.1	25.0[2]	23.7	58.3	57.6[2]	53.9
West Germany	31,526	35,006	55,459	23.7	24.6	22.9	50.3	51.8	47.4
Japan	18,197	18,915	45,097	13.6	19.4	21.6	27.4	33.7	30.7
United Kingdom	11,707	16,210	22,139	22.3	22.7	20.7	57.6	60.1	59.1
France	11,525	13,748	19,939	15.2	18.0	16.7	46.3	48.4	47.7
Italy	7,701	10,543	20,348	18.1	18.8	20.8	51.6	55.3	60.7
Netherlands	2,253	4,365	7,459	9.4	8.7	9.3	49.0	46.4	45.7
Spain	438	1,489	2,594	8.5	11.4	9.6	38.9	43.2	38.9
Hong Kong	87	329	3,117	1.7	2.9	8.8	12.1	18.2	39.5
Singapore	186	463	2,904	5.2	4.6	12.9	23.2	18.2	33.4
Mexico	240	163[3]	2,813[4]	9.8	4.7[3]	11.7[4]	51.7	64.8[3]	-
Brazil	105	831	1,355[5]	1.7	6.6	6.2[5]	34.4	42.7	73.5[5]
Korea	83	727	2,753	2.6	5.7	7.9	20.6	25.7	22.7

Source: UN; Yearbook of International Trade Statistics, 1974, 1979, 1986.
OECD, Foreign Trade Series C, 1983, 1986.

Note: 1) SITE (7 + 6911), Revision 1, 11
2) 1977
3) 1976
4) 1984 (estimated value)
5) 1983 (estimated value)

and Brazil amongst the NICs, equivalent to 6.1 % of Japan's exports and 88.3 % of Hong Kong's, although Korea nearly quadrupled the value of plant exports as compared with that of 1978. The ratio of plant exports to total Korean exports was 7.9 % in 1986, which was extremely low as compared with about 20.0 % for major OECD developed countries and 12.9 % for Singapore and 8.8 % for Hong Kong. It would appear, thus, that Korea faces severe international competition in terms of prices, particularly from Singapore and Hong Kong, Korea's major trading rivals. In response, Korean firms will be required to improve the quality of their products and to invest heavily in R & D because their firm specific advantage (low wages) is no longer superior to their trading rivals. The ratio of general plant exports to machinery exports was also extremely low in 1986 as compared with a 50-60.0 % ratio for major developed countries. In the case of Korea, the ratio (22.7 %) was the lowest amongst the NICs.

Table 7.15 and 7.16 give international comparisons of general plant exports between the developed countries and NICs, broken down by machinery and tools. Among NICs, Brazil, Singapore and Spain more closely approach the export structure of developed countries, whereas South Korea, Mexico and Hong Kong fall far behind. As mentioned previously, the exports of electrical power machinery and switchgears, telecommunications equipment and structural iron and steel in Korea share 50-60.0 % of total plant exports. In other words, the relative importance of general machinery, which represents the core of plant exports in most countries, is too low. On the other hand, in the United States, the importance of aircraft is relatively high, and in Japan,

TABLE 7.15

International Comparison of General Plant Exports by the Developed Countries

Unit: US $ Million, (%)

Countries / Production Classification	United States		West Germany		Japan		United Kingdom		France		Italy		Netherlands	
	1977	1986	1978	1986	1978	1986	1978	1986	1978	1986	1978	1986	1978	1986
Total Exports	121,293	217,304	142,454	242,411	103,045	209,153	67,912	107,013	76,502	119,435	56,056	97,802	50,151	80,555
General Plant Total	29,983 (100)	51,520 (100)	35,006 (100)	55,459 (100)	18,915 (100)	45,097 (100)	16,210 (100)	22,139 (100)	13,748 (100)	19,939 (100)	10,543 (100)	20,348 (100)	4,365 (100)	7,459 (100)
Railway Vehicles	(1.0)	(1.0)	(1.0)	(0.7)	(3.4)	(0.5)	(1.0)	(0.6)	(2.7)	(2.5)	(0.9)	(0.4)	(0.2)	(0.3)
Aircraft Etc	(19.6)	(29.7)	(3.2)	(5.1)	(0.3)	(0.3)	(11.7)	(18.4)	(6.2)	(11.5)	(3.9)	(5.1)	(7.1)	(8.8)
Other General Plant	(79.4)	(69.3)	(95.8)	(94.2)	(96.3)	(99.2)	(87.3)	(81.0)	(91.1)	(86.0)	(95.2)	(94.5)	(92.7)	(90.9)
Power Machinery Non-Elec	12.3	17.1	11.4	10.0	12.6	11.0	17.0	18.5	12.4	13.8	8.0	7.3	8.9	9.0
Agricultural Machinery	6.3	2.9	4.0	3.5	4.1	2.6	6.2	4.1	4.0	3.1	6.8	5.1	4.8	4.1
Textile & Leather Machinery	1.1	1.1	4.7	6.3	3.4	4.6	2.8	2.0	2.9	2.4	3.8	7.1	2.4	3.1
Metalworking Machinery	2.5	3.0	7.6	7.8	6.7	9.2	3.4	3.8	3.5	3.2	6.4	7.5	1.6	3.3
Machines for Special Industries	11.9	13.8	10.8	19.1	6.2	12.8	11.3	14.5	10.8	12.8	9.1	20.1	9.8	16.8
Machines NES Non-Elec	27.5	14.1	37.6	28.3	29.2	20.8	26.3	20.1	32.9	24.6	40.3	31.6	35.9	26.6
Elec Power Mach, Switchgear	7.8	7.0	10.8	11.3	13.3	12.4	9.0	8.4	12.4	13.5	7.3	6.1	11.1	9.9
Electr Distributing Machine	1.3	1.9	1.8	1.7	3.2	2.1	2.1	1.6	2.4	2.3	2.3	1.7	3.0	2.7
Telecommunication Equipment NES	6.4	8.0	5.0	4.8	13.9	22.3	6.1	6.5	5.5	8.0	5.0	5.0	8.3	10.3
Structures, Parts Iron, Steel	1.3	0.3	2.1	1.3	3.7	1.5	3.3	1.5	4.2	2.2	6.3	3.0	6.9	5.1

Source: OECD Foreign Trade Series C, 1983, 1986.
UN; Yearbook of International Trade Statistics, 1978, 1979, 1986.

TABLE 7.16

International Comparison of General Plant Exports by NICs

Unit: US $ Million, (%)

Countries / Production Classification	Spain		Hong Kong		Singapore		Mexico		Brazil		Korea	
	1978	1986	1978	1986	1978	1986	1978	1984	1978	1983	1978	1986
Total Exports	13,115	27,156	11,499	35,440	10,134	22,428	5,899	24,054	12,527	21,898	12,711	34,714
General Plant Total	1,489 (100)	2,594 (100)	329 (100)	3,117 (100)	463 (100)	2,904 (100)	163 (100)	2,813[1] (100)	831 (100)	1,355[1] (100)	727 (100)	2,753 (100)
Railway Vehicles	(3.3)	(1.0)	(-)	(-)	(0.1)	(.1)	(3.1)	(-)	(3.0)	(4.4)	(1.8)	(1.3)
Aircraft Etc	(4.0)	(5.5)	(3.3)	(1.4)	(9.3)	(5.2)	(2.3)	(0.7)	(4.3)	(7.0)	(18.8)	(11.2)
Other General Plant	(92.7)	(93.6)	(96.7)	(98.6)	(90.6)	(94.7)	(94.6)	(99.3)	(92.7)	(88.6)	(79.4)	(87.5)
Power Machinery Non-Elec	7.9	15.2	14.4	2.0	18.3	5.9	39.5	32.9	35.9	32.9	3.4	5.8
Agricultural Machinery	6.2	2.2	0.2	0.1	0.9	0.2	1.9	0.5	11.8	6.3	0.3	0.2
Textile & Leather Machinery	6.3	6.2	10.1	7.6	1.4	1.2	1.0	0.1	1.0	2.9	3.8	1.5
Metalworking Machinery	10.5	9.2	3.2	3.4	4.3	2.1	0.4	0.2	2.6	5.0	0.7	1.5
Machines for Special Industries	8.6	9.3	3.5	9.7	26.3	11.2	6.0	2.1	10.3	6.5	4.1	3.8
Machines NES Non-Elec	30.2	30.2	17.8	12.3	36.9	22.8	29.5	2.8	20.8	18.2	7.0	11.0
Elec Power Mach, Switchgear	8.4	9.4	15.9	23.0	25.0	32.5	7.1	32.2	5.8	6.1	11.2	11.4
Electr Distributing Machinery	4.2	5.1	2.2	2.2	2.4	1.3	2.6	2.0	0.9	4.2	6.3	4.8
Telecommunication Equipment NES	3.8	4.1	28.1	37.5	8.0	16.6	4.7	26.3	2.9	4.2	27.7	30.4
Structures, Parts Iron, Steel	6.4	2.7	1.6	0.8	6.0	1.0	1.8	0.2	0.7	2.3	14.9	17.0

Source: See TABLE 7.15.

Note: 1) Estimated value by the United Nations.

Hong Kong, Singapore, Mexico and Korea, the relative importance of telecommunication equipments and electric power machines and switchgears is high.

7.3 CONTEMPORARY OVERSEAS' CONSTRUCTION EXPORTS FROM KOREA

This section discusses: a) the trend of overseas' construction exports since 1976; b) the trend of overseas' construction exports by region since 1980; c) an international comparison of overseas' construction exports; d) the structure of the Middle-East construction market, and e) the prospect for overseas' construction exports in 1989.

7.3.1 THE TREND OF OVERSEAS' CONSTRUCTION EXPORTS

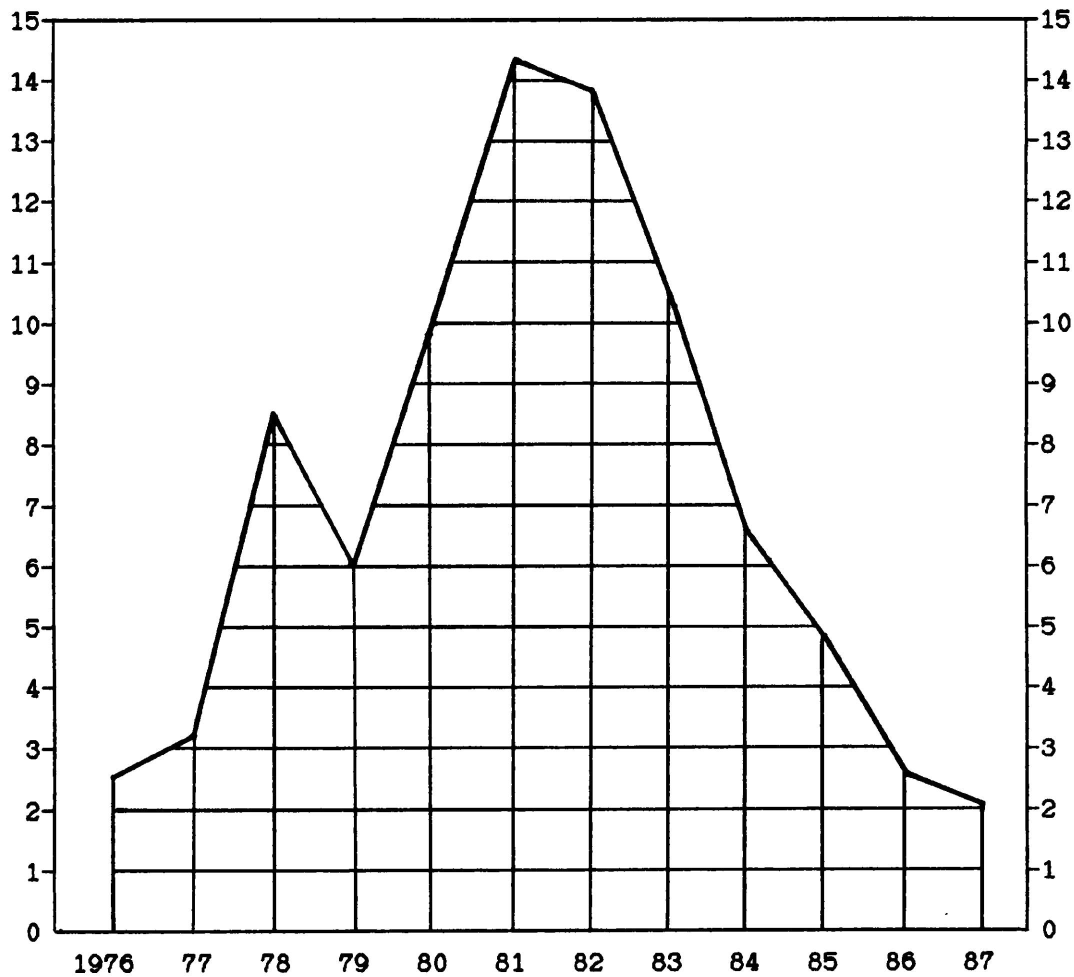
Graph 7.4 shows the trend of overseas's construction exports in Korea from 1976-87. With growth in the industry seen as a way of helping the country adapt to the oil price rises of the 1970s, Korean companies pushed hard for business, mainly in the Middle-East. Korea's work values, low wages, sympathetic government and aptitude for new ventures together have propelled the nation in recent years into a international construction nation. Thus, as can be seen in Graph 7.4, orders increased from around US $ 2.5 bn in 1976 to peak levels of over US $ 13.5 bn in both 1981 and 1982. However, since then the trend has been downwards, orders falling to US $ 2.1 bn. Falling oil prices have contributed to the decline of the global construction industry. In Korea employment in the industry has fallen from a peak of 170,000 to around 100,000. According to the Korea Institute of Economics and

Technology, even though each US $ 5-a-barrel fall in the price of imported oil improves the current account by US $ 1.1 bn in a full year, it results in a heavy loss of revenue from construction contracts in the Middle-East, which has shared about 69.0 % of total construction exports throughout the 1980s (see Table 7.17).

Graph 7.4

The Trend of Overseas' Construction Exports (1976 - 87)

Unit: US $ Billion



Source: Financial Times, April 9, 1986, Survey, pp. 8.
Engineering News-Record, July 16, 1987, July 7, 1988.

Korea's construction firms' problems were increased by the emergence of counter-trading, e.g. payments by some countries with oil instead of cash. Thus, the Daewoo group lost roughly US $ 8 million in 1982 as a result of payment for construction work in Libya with oil instead of currency. Daewoo had construction contracts in Libya worth US $ 2.15 bn for which Libya paid with crude oil on a (so-called) government selling price, which was between US $ 4 and $ 5 over the world spot market. Since Daewoo sold most of the oil on the spot market, losses resulted.

A further factor is that Korea now faces growing competition from other countries. As Korean wage levels are relatively high, companies increasingly plan to make use of cheaper labour from Sri Lanka, Malaysia, Thailand and the Philippines. As a competitive response, the Korea Development Institute is urging construction contractors to attack the Middle-East market with more sophisticated design engineering since Korea's share of labour-intensive construction orders is declining. Construction workers monthly earning in the Middle-East at the end of 1981 was US $ 1,210 for Koreans, US $ 660 for Indians, US $ 540 for Pakistanis and US $ 430 for workers from Bangladesh (Asian Wall Street Journal, 4th October 1982, pp.5). The profit margins of Korean companies have reflected this increasing competition: from 15.0 % of contract value in 1978, average profits dropped to 5.0% in 1981. That Korean companies should aim for higher value-added work (instead of simple engineering jobs) and invest more in R & D is a rational response to market pressures. But Koreans still lack the necessary engineering skills for overseas jobs. Most of the 53 Korean construction companies at work on projects in 35 different countries would be unable to complete complicated building projects without foreign know-how (Financial Times: London Edition, 8th January 1985, pp.4). Therefore, Korean contractors may be required to make more extensive use of joint ventures as a means of obtaining this know-how.

7.3.2 THE TREND OF OVERSEAS' CONSTRUCTION EXPORTS BY REGION

The trend of overseas' construction exports by region in Korea can be seen from Table 7.17.

TABLE 7.17

The Trend of Overseas Construction Exports by Region (1980-1987)

Unit: US $ Billion

Region \ Year	1980	1981	1982	1983	1984	1985	1986	1987	1980-87 Total
Total	9,9 (100)	14,3 (100)	13,8 (100)	10,4 (100)	6,6 (100)	4,8 (100)	2,6 (100)	2,1 (100)	64,5 (100)
Middle-East	7,6 (76,8)	10,5 (73,4)	10,7 (77,5)	4,8 (46,2)	4,9 (74,2)	3,4 (70,8)	1,2 (46,2)	1,6 (76,2)	44,7 (69,3)
Asia	0,7 (7,1)	1,4 (9,8)	2,4 (17,4)	1,2 (11,5)	0,8 (12,1)	0,4 (8,3)	0,9 (34,6)	0,4 (19,0)	8,2 (12,7)
Africa	1,6 (16,2)	2,4 (16,8)	0,6 (4,3)	4,4 (42,3)	0,9 (13,6)	1,0 (20,8)	0,4 (15,4)	0,1 (4,8)	11,4 (17,7)
Latin America	- (-)	- (-)	1) (-)	1) (-)	1) (-)	1) (-)	1) (-)	1) (-)	0,1 (0,2)
Europe	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	1) (-)	- (-)	- (-)
North America	1) (-)	- (-)	- (-)	- (-)	- (-)	1) (-)	0,1 (3,8)	1) (-)	0,1 (0,2)

Source: Engineering News-Record, July, 1981-88.
Note : ( ) Share Ratio.
1) Below US $ 50 Million.

The Korean firms won a total of US $ 64.5 bn in foreign contracts from 1980 to 1987. The Middle-East has been the favourite market of Korean contractors in recent years, accounting for 69.3% of their total. Africa and the Asian market shared 17.7 % and 12.7 % of the total value for eight years, respectively. As shown in Table 7.17, however, the other regions, Latin America and North America, each shared only 0.2 %.

As explained in the previous sub-section, the relative success of the Korean firms in the Middle-East could be attributed to a major country-specific factor, a ready access to a pool of cheap labour that could substitute working overseas for an international contractor for service in the Armed forces. They had a firm-specific advantage rooted in a country-specific factor, namely, plentiful supplies of cheap labour in Korea. Thus, Korea exported US $ 10.7 bn to the Middle-East in 1982 (77.5 % of their total) and achieved the second largest value of overseas construction exports in that region after the United States. However, since then, Korean contractors have begun to lose the ownership advantage that was specific to them and was particularly relevant to the Middle-East market (low wages), due to relatively high wage levels compared with those of Sri Lanka, Malaysia, Thailand and Turkey. Accordingly, Korea experienced a major fall in demand of minus 55.1 % in 1983 in the Middle-East. Because demand was spasmodic, and the production base of the contractor is highly mobile, the Korean contractors might have gained by serving several markets using exporting and FDI simultaneously, thus giving Korean contractors the opportunity to diversify the risk associated with international construction (political risk, fluctuating market demand, etc.) and to utilise their ownership advantages to a greater extent than operating in only one market.

Somewhat belatedly, the Korean contractors seem to have become more aware that they can no longer adapt a cost-saving strategy based on low wages (cuts) to survive increasing competitive pressures abroad. The latest phenomenon, in fact, reflects the builders' attempt to break away from their easygoing day-to-day operational style, in awareness of new global market trends which are moving toward technology competition and away from price competition. The Korean government has encouraged self-help initiatives within firms by allowing them to allocate up to 0.15 % of their total turnover to research and development activities and encouraging them to operate their own research institutions.

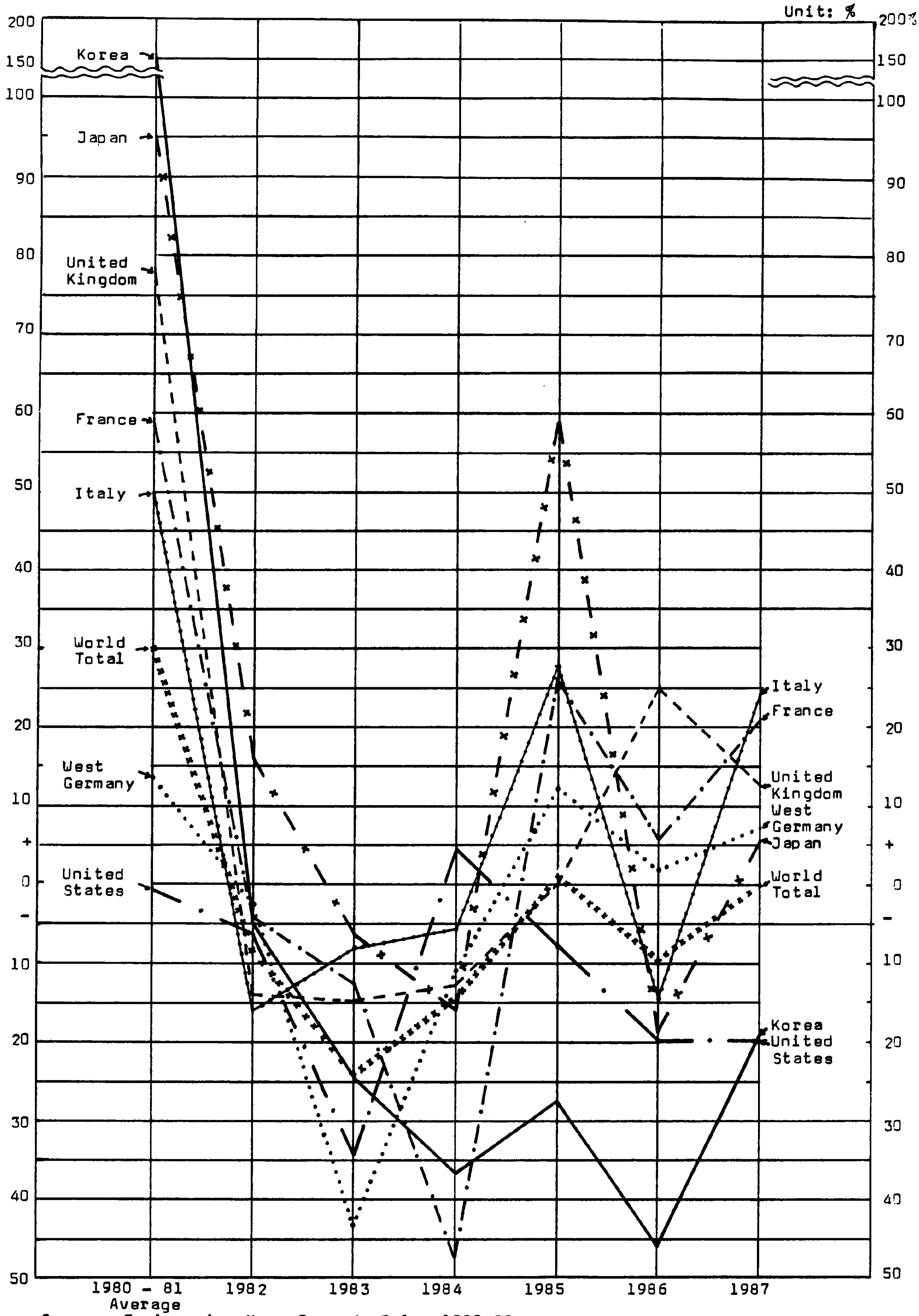
In general, an important task which the overseas' construction industry in Korea faces is how to diversify, thus reducing the current level of dependence on the Middle-East. However, low interest finance subsidised by Japan in Asia and the technological constraints against advancement in Europe, Canada and the United States render the task an extremely difficult one.

7.3.3 INTERNATIONAL COMPARISON OF OVERSEAS' CONSTRUCTION EXPORTS

Graph 7.5 and 7.6 show the international comparison of overseas' construction exports by major exporting countries. As can be seen from Graph 7.5, the growth rate per annum of Korea in overseas' construction exports decreased from 150.0 % in 1981 to minus 5.0 % in 1982, a falling trend which continued into 1984. As explained previously, the reasons were a large drop in orders from oil producing countries in the Middle-East, more severe competition for simpler engineering jobs from low-wage countries and an inferior comparative advantage in high technology. In

Graph 7.5

The Change in Growth Rate in Overseas Construction Exports by Major Exporting Countries (1980 - 87)

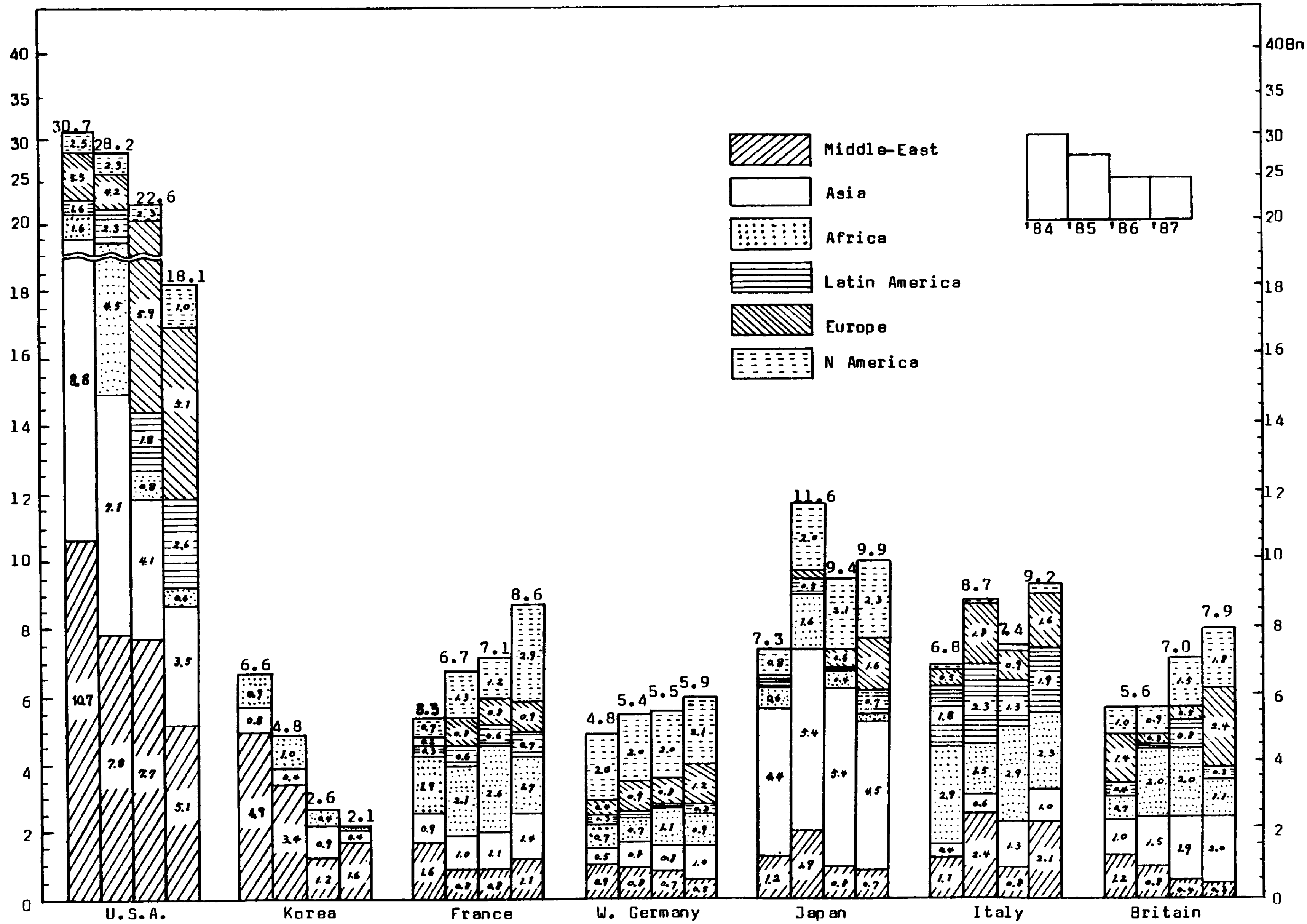


Source: Engineering News-Record, July, 1980-88.

Graph 7.6

The Change in Construction Exports by Major Countries and Region (1984 - 1987)

Unit:US $ Billion



Source: Engineering News-Record, July 18, 1985, July 17, 1986, July 16, 1987, July 7, 1988.

1985, all major exporting countries except Korea, the United Kingdom and the United States showed a marked growth rate, in particular a 58.9 % increase by Japan, which exported the value of US $ 11.6 bn in 1985 compared with US $ 7.3 bn in 1984. The Asian market was the most buoyant market in 1985, followed by North America market with a growth rate of 150.0 %, confirming both the accuracy of Japan's forecast that the Middle-East market would decline and its decision to divert and extend its activities in the Asian and the United States' market. As a consequence, Japan was able to avoid a decline in foreign volume and instead became the second largest exporting country through market diversification.

Graph 7.6 shows the change of construction exports by major countries and regions from 1984 - 87. In 1987, all major exporting countries, with the exception of the United States and Korea, showed an increase in their total export value. In the case of Korea, her foreign volume fell again in 1987, to US $ 2.1 bn in consequence of her over-dependence on the depressed Middle-East market.

7.3.4 THE STRUCTURE OF THE MIDDLE-EAST CONSTRUCTION MARKET

The Middle-East construction market, which shares over 60.0 % of total overseas' construction exports, is the most important market for Korea. Thus, it is essential to analyse the structure of the Middle-East construction market in order to understand the problems which confront Korea.

Table 7.18 shows the structure by major exporting country and industry type in the Middle-East based on total value from 1975-84. The

TABLE 7.18

The Structure by Major Exporting Country and Industry in the Middle-East(based on Total Value from 1975-84)

Unit: US $ Million, (%)

Industry / Country	Engineering Work	Construction	Special Plant	Electricity	Communication	Service
Total	96,318.1(100.0)	113,317.6(100.0)	122,619.9(100.0)	15,186.7(100.0)	18,585.7(100.0)	13,436.6(100.0)
Saudi-Arabia	7,154.4(7.43)	12,440.0(10.98)	2,672.2(2.18)	776.0(5.11)	819.2(4.41)	2,201.6(16.39)
Turkey	4,321.8(4.39)	5,584.8(4.93)	743.4(0.61)	6.8(0.04)	13.3(0.07)	2.3(0.02)
Korea	16,684.6(17.32)	17,535.4(15.47)	5,602.8(4.57)	570.0(3.75)	- (-)	83.4(0.62)
Japan	2,949.0(3.06)	4,118.5(3.63)	25,617.8(20.89)	2,514.4(16.56)	1,100.1(5.92)	506.7(3.77)
United States	5,095.6(5.29)	6,360.1(5.61)	17,659.1(14.40)	822.2(5.41)	3,617.9(19.47)	2,889.1(21.50)
West Germany	6,827.4(7.09)	7,709.3(6.80)	17,006.6(13.87)	2,446.6(16.11)	1,568.4(8.44)	253.4(1.89)
United Kingdom	2,944.7(3.06)	4,285.3(3.78)	5,001.6(4.08)	776.1(5.11)	1,001.5(5.39)	2,615.3(19.46)
France	7,014.1(7.28)	9,886.2(8.72)	12,226.5(9.97)	1,140.1(7.51)	3,211.9(17.28)	487.4(3.63)
Italy	6,624.8(6.88)	4,535.7(4.00)	14,189.6(11.57)	437.6(2.88)	1,496.1(8.05)	512.1(3.81)
Netherlands	4,498.2(4.67)	3,654.2(3.22)	1,119.8(0.91)	716.5(4.72)	1,167.0(6.28)	225.1(1.68)
Yugoslavia	5,805.3(6.03)	3,258.3(2.88)	714.5(0.58)	470.5(3.10)	254.5(1.37)	65.3(0.49)
Others	26,488.2(27.50)	33,949.8(29.95)	20,066.0(16.36)	4,509.9(29.70)	4,343.8(23.38)	3,594.9(26.75)

Source: Middle-East Economic Digest.

Note : ( ) Share Ratio.

features found in the structure are as follows: Firstly, in the labour-intensive sectors, engineering work and construction, the share ratio of Saudi-Arabia and Turkey is relatively high, but the share ratio of Korea is very high in absolute terms. The share ratio of the Middle-East countries (particularly Saudi-Arabia) is also relatively high, reflecting the trend towards construction by native firms in the Middle-East.

The low Korean ratios in the remaining sectors (See Table 7.18), relative to the major competitors from the developed countries, is a further indication that Korean overseas contractors, which once thrived on the basis of cheap labour, must become orientated towards technological innovation if they wish to remain competitive.

As shown in Table 7.19, the growth in construction by native firms in the Middle-East has had a significant effect on the export-import ratio (i.e. orders received ÷ orders placed x 100). In 1975, for example, the ratio of orders received by value to the value of orders placed was only 2.3 %, compared with 27.9 % in 1984. In terms of the number of orders, the ratio had increased to 43.8 % in 1984 from 9.9 % in 1975. In Saudi-Arabia, this ratio was greatly influenced in 1983 by legislation which required foreign contractors to offer not less than 20.0 % of the value of a contract to local joint venture partners. Thus, local Saudi construction firms were able to become involved more frequently in Saudi construction projects and to improve their market penetration through joint ventures, a trend which adversely affected the value of Korea business in the Middle-East, which decreased to US $ 1.6 bn in 1987 from US $ 10.7 bn in 1982.

TABLE 7.19

The Trend of Construction by Native Firms in the Middle-East (1975-1984)

Unit: US $ Million, (%)

Item / Year	Value of Orders Received (A)	Total Value of Orders Placed (B)	A/B (%)	No of Receiving Orders by Own Country (C)	Total No of Orders Placed (D)	C/D (%)
1975	609.5	26,917.8	(2.3)	39	394	(9.9)
1976	2,366.2	37,485.4	(6.3)	46	428	(10.7)
1977	2,998.7	49,205.8	(6.1)	85	546	(15.6)
1978	2,336.1	31,751.8	(7.4)	83	560	(14.8)
1979	3,339.0	30,574.4	(10.9)	99	516	(19.2)
1980	6,540.1	38,800.9	(16.9)	254	783	(32.4)
1981	6,444.7	62,589.4	(10.3)	263	912	(28.8)
1982	8,794.8	45,667.5	(19.3)	291	868	(33.5)
1983	5,174.6	33,494.3	(15.4)	228	647	(35.2)
1984	6,419.3	22,979.5	(27.9)	315	720	(43.8)

Source: Middle-East Economic Digest.
Note : ( ) Share Ratio.

Table 7.20 shows the ratio of orders received by the joint ventures of seven major exporting countries to the Middle-East (based on the total value from 1975 to 1984). Japan's ratio of orders received through joint venture arrangements was 42.4 %, the largest share among the seven countries. Korea, in common with the United Kingdom, recorded a relatively low ratio (16.5 %), demonstrating the need for a greater commitment to joint ventures by Korean firms in their efforts to increase their ratio of winning bids.

TABLE 7.20

The Ratio of Orders Received by Joint-Ventures of Major Exporting Countries in the Middle-East (based on Total Value from 1975 to 84)

Unit: US $ billion(%)

Country / Item	United States	Korea	Japan	France	West Germany	Italy	United Kingdom
Value of Received Orders by Joint Venture (A)	10.2	6.7	15.6	10.9	10.5	8.0	2.6
Total Value of Received Orders (B)	36.4	40.5	36.8	34.0	35.8	27.8	16.6
Ratio of A to B (A/B x 100)	(28.0)	(16.5)	(42.4)	(32.0)	(29.3)	(28.8)	(15.9)

Source: Middle-East Economic Digest.

The country structure of joint venture partners in the seven major exporting countries is portrayed in Table 7.21. 77.8 % of the UKs joint ventures were in the Middle-East, compared with 54.7 % for Korea and 49.0 % for the US. However, all seven countries experienced the highest ratio of joint ventures with the Middle-East, reflecting the power of Saudi-Arabia to enforce such arrangements. In the case of Korea, the table shows that there was a low ratio of joint ventures between Korean firms (11.0 %), in consequence of which competition and rival bids among Korean contractors may have been responsible for low tenders and subsequent mid-stream liquidations. Fortunately, a new contract ceiling system was designed by the Korean government for construction projects to prevent ruinous competition among contractors and poor-quality construction. The new system became effective on July 1, 1986. The maximum amount a Korean firm can tender for at one time is determined by

TABLE 7.21

The Structure of Joint-Venture Partner in Major Exporting Contries(1975-84)

Unit: No of Case, (%)

Partner \ Country	United States	Korea	Japan	France	West Germany	Italy	United Kingdom
Total	98(100)	53(100)	147(100)	100(100)	113(100)	86(100)	198(100)
Middle-East	48(49.0)	29(54.7)	21(14.3)	28(28.0)	29(25.7)	20(23.3)	154(77.3)
Saudi Arabia	20	23	16	6	12	5	40
Kuwait	7	1	1	-	3	1	7
U A E	2	-	-	2	-	-	41
Iran	2	1	-	1	1	1	1
Iraq	-	-	-	1	-	-	3
Libya	-	-	-	-	-	2	-
Egypt	5	-	2	5	2	1	9
Jordan	2	1	1	2	2	-	12
Turkey	3	-	1	-	7	3	2
Oman	4	1	-	-	1	-	23
United States	23(23.5)	1	1	6	2	7	5
Korea (South)	1	6(11.3)	5	2	2	4	-
Japan	1	5	105(71.4)	3	1	-	1
France	6	2	3	38(38.0)	4	3	2
West Germany	2	2	1	4	31(27.4)	8	3
Italy	7	4	-	3	8	29(33.7)	5
United Kingdom	5	-	2	2	3	5	18(9.1)
Other							
Europe	5	3	4	13	27	8	9
Asia	-	1	2	-	1	-	1
Latin America	-	-	1	-	-	1	-
Communist Bloc	-	-	2	1	5	1	-

Source: Middle-East Economic Digest.

Note: ( ) Share Ratio.

its construction performance at home and abroad in the previous two years, with consideration given to financing and technological capability.

7.3.5 THE PROSPECT FOR OVERSEAS' CONSTRUCTION EXPORTS IN 1989

In 1988, Korean contractors received only US $ 1.6 bn worth of construction orders from foreign countries, down 6.4 % on the previous year (Korea Newsreview, January 14, 1989). The reduction of orders in 1988 was largely due to low levels of reconstruction activity in Iran and Iraq after the Gulf war, a delay in Libya in its orders for a major waterway project and a poor bid performance by the Hyundai Construction Company.

The Korean Ministry of Construction, however, has forecast that Korean contractors are likely to win overseas' construction orders worth between US $ 3.0 bn and US $ 7.0 bn in 1989. The ministry forecast is based on expectations that Korean firms can win a contract for the second phase of Libya's "Great Man-Made River" project, worth US $ 3.7 bn, and be favoured for contracts for post-war rehabilitation projects in Iran and Iraq. According to the forecast, Korean contractors are expected to win US $ 461 million worth of construction orders from Saudi Arabia, US $ 733 million from Libya not including the second phase of the Great Man-Made River project, US $ 469 million from Iraq, US $ 875 million from Iran and US $ 500 million from other countries (Korea Newsreview, January 14, 1989).

Korean contractors are also expected to respond to open market opportunities in Communist countries in line with the government's "northern policy" and to advance into the Japanese construction market where Korean firms have won licences for construction activities. These prospects can be verified by the following evidence:

- Hong Soun-ghil, president of the Overseas Construction Association of Korea (OCAK), following a visit to the Soviet Union, claimed that the Soviet Union has officially asked Korea to construct hotels in Moscow and other large cities and plants to produce construction materials (Korea Newsreview, December 31, 1988).

- Major Korean construction firms are pushing ahead with plans to form a consortium with the U.S. and Japanese firms in their efforts to participate in the Siberia development plan. In the proposed consortium, Korean firms are to undertake construction works, while the U.S. and Japanese firms will provide capital and design technology (Korea Newsreview, December 17, 1988).

- The Korean Construction Minister told business leaders on August 19, 1988 that the Korean government will seek ways for contractors to enter the Chinese construction market via joint-ventures. He added that to overcome the slump in overseas construction in recent years, exploration of construction markets other than in the Middle-East is indispensable (Korea Newsreview, August 27, 1988).

- In 1989 Korean contractors are expected to increase their penetration of the U.S. construction markets either directly, or by renting out shopping centres and hotels after construction. Korea's Daewoo Corp. participated in a US $ 155 million project for the construction of a retirement community in Issaquah, Washington, in the United States, marking this as the first time for a Korean company to make inroads in the U.S. construction market (Korea Newsreview, June 4, 1988).

- Ssang-yong Construction Co. began the construction of the Bay Plaza Shopping Centre, a combination of offices and shopping malls in San Francisco in 1988 (Korea Newsreview, June 18, 1988). Thus, Korean construction firms may be in the process of accumulating general know-how in engineering and maintenance services through their advance in the U.S. market.

- The Iraqi Minister of Housing and Construction, who visited Korea in December 1988, said that his country will give priority to Korean companies which worked in Iraq throughout the war years when bidding begins for her post-war rehabilitation projects. But he added that such factors as competitiveness of prices, duration of work, quality of technology and the source of financing will be important facators influencing successful bidding for the reconstruction projects (Korea Newsreview, December 24, 1988).

7.4 PROBLEMS ASSOCIATED WITH PLANT AND OVERSEAS' CONSTRUCTION EXPORTS FROM KOREA

The problems associated with plant and overseas construction exports should be clearly identified and investigated before suggesting strategic options (which will be presented in Chapter 12) to improve the performance of Korean plant and construction exports. Therefore, this section investigates problems associated with: a) plant exporters (i.e. general trading firms, plant engineering firms and traders specialising in machinery production); b) support systems for plant exports; and c) overseas construction exports.

7.4.1 THE PROBLEMS FOR EXPORTS OF PLANT

This sub-section deals with the problems that plant exporters, such as general trading firms, plant engineering firms and traders specialising in machinery production, face.

General Trading Firms

The role of the general trader is to offer strong financial and market support to their subsidiaries. From their inception, Korean general traders have experienced many problems because of their dependence on government initiatives, in contrast to firms in Japan which have greater autonomy. Most Korean traders began operations without the ability or the readiness to offer the full range of services to support the expansion plans of domestic firms. Further, the competition between export companies and financial organisations seeking accreditation as general traders was harmful to small and medium-sized enterprises.

The major bottlenecks to the promotion by general traders of exports of plant and heavy-chemical products are as follows:

1. The appointment of firms is dependent on the government and on hereditary ownership.
2. The pursuit of rapid growth has been biased towards external performance.
3. Distorted management attitudes regard the neglect and sacrifice of small and medium sized enterprises as inevitable.
4. An insufficient number of employees in foreign branch offices makes

it virtually impossible to fully develop overseas market.

5. The lack of investment in management and technical education.
6. The lack of long-term market development and marketing activities.
7. The lack of long-term business plans.

Plant Engineering Firms

The Korean engineering industry consists of specialised technological service firms (147), amalgamated construction firms providing technological services (2) and plant engineering firms (15). This high ratio of technological service firms has been influenced by a supportive tax system (Korean law no. 3017, 19th December 1977), such as a 50 % reduction of corporation tax enjoyed by such firms. As a result of these favourable tax concessions, many financial and commercial enterprises established engineering firms, but failed to secure the technological manpower which they required. Thus, they lacked both the competence to act in foreign markets and a sound technological foundation. Most engineering firms have remained heavily dependent on the domestic market because it has been difficult for them to extend their business to foreign markets. In particular, after reducing their investment in the heavy-chemical industry, in accordance with a government policy for economic stabilisation, the domestic engineering market became narrower and unfairly competitive (e.g. dumping became excessive).

The problems associated with such engineering firms are summarised as follows:

1. Financial combines established plant engineering firms with a view

to short-term earnings. These became technological sub-contracting enterprises within the financial combines.

2. The profusion of firms resulting from the ease of registration as a plant engineering firm induced small-scale activities with limited capital and technological manpower. In contrast, only one large-scale engineering firm in Taiwan and three in Japan have most of the domestic plant engineering in their respective markets, and are better able to specialise in plant exports, accumulate technology and acquire technological manpower.
3. Excessive competition among native firms chasing orders for Korean domestic technological projects.
4. The lack of accumulated technology and the inability of Korean firms to effectively collect information on foreign markets.
5. Weak project management and an inability to carry out feasibility studies and prepare basic designs. Although project plans, purchase procurement, inspection, engineering work management and plant construction are within the competence of Korean firms, in the case of project plans and engineering works management, Korean plant engineering firms are dependent on consulting advanced technology firms in foreign countries.

Traders Specialising in Machinery Production

International competitive power is a combination of price, technology, brand, experience, date of delivery, project management ability and finance. In this light, no matter how good the facilities and technologies introduced may be, or how diverse the production of machinery and tools, there are many constraints impeding the development of foreign markets.

The greatest problems are to become internationally recognised, to be seen to have experience in the successful establishment of plant, to conduct test runs on plant and to offer efficiency guarantees. These aspects determine whether a brand is generally recognised. Date of delivery reliability is also an important consideration. Generally, the opinion of policy makers and businessmen is that traders specialising in machinery production should strive for economies of scale by increasing the ratio of home based mechanical operations to foreign imported products and yet offer a wide portfolio of products. However, in reality, even if newly-established mechanical workshops, with financial help, introduce large quantities of advanced machinery and advertise an extensive variety of products abroad, it is doubtful whether they would be fully recognised in the foreign market.

In the case of home consumption, if the existing producers of plant were to be encouraged to develop Korean domestic markets, the absorption and diffusion of technology and greater specialisation could be accelerated. On the other hand, the emergence of newly-established mechanical engineering firms to serve the domestic market would not be beneficial to the Korean economy.

On the whole, the problems associated with traders in machinery can be summarised as follows:

1. Diseconomies of scale are present due to duplicated investment, excessive facilities and a superabundance of technical partnerships.

2. The specialised mechanical engineering workshops do not intensively develop areas of specialisation due to a distorted government policy for developing the machine industry, which induces a preference for the status quo.
3. The financial combines which have penetrated the machine industry have a short-term orientation and are excessively dependent upon government support.

7.4.2 SUPPORT SYSTEMS FOR PLANT EXPORTS

This sub-section deals with problems with support systems for plant exports, such as information systems, education facilities, the level of heavy-chemical industrialisation (hardware) and the level of technology and R & D.

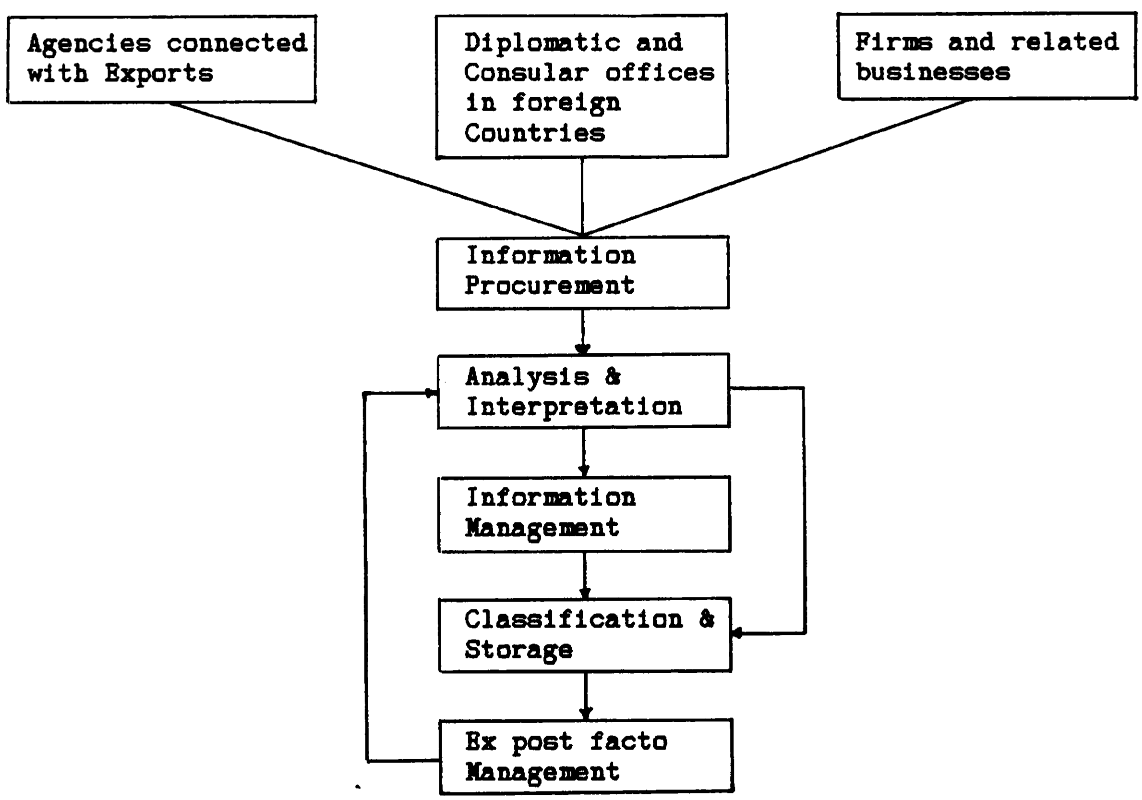
The Unsettled Nature of Information Systems

One of the important external economic factors which influence the success or failure of a tender to supply plant is the quality of informational feedback within the general information system. Feedback relates to procurement, analysis, interpretation, management, arrangement and storage of information (see Figure 7.1). The success of plant exporting firms is likely to be dependent on the development of an informations network, which can supply intelligence reports on such things as market trends, political, economic and cultural features and changes, development programmes and demand forecasts.

In most cases, Korean firms procure information concerning the purchase of an industrial installation scarcely 2-3 months prior to the bidding date. In consequence, they lose the opportunity to analyse their ability to meet delivery requirements and prepare competitive proposals, resulting in many failed bids.

Figure 7.1

The Feedback of Information in Industrial Installation Schemes.



Lack of Sophistication in Educational Facilities

The salesmen in charge of industrial plant exports need to be knowledgeable in such fields as technology, trade, finance and the environment (political, social and cultural influences) and to have linguistic ability. The training of engineer-salesmen is essential due to their need to understand engineering mechanisms and to be able to apply them to actual production. These activities of salesmen have a direct bearing on the success of plant exports. In the case of many Korean firms, after graduating from university, employees with only three years experience, or less, are often required to draw up practical plans without special education or training. Even new employees with a humanities background and no basic understanding of engineering often participate in design and project management without specialist training.

There are no special educational institutions to train plant (engineering) salesmen in Korea. Nor are there businesses which specifically train their employees to assume responsibility for plant exports. It makes little economic sense to promote plant exports without prior educational investment, a failing which will render Korea's objective of participation in world plant and technological industrial markets even more difficult as time goes on.

<u>The Low Level of Heavy-Chemical Industrialisation (Hardware)</u>

The ratio of Korea's heavy-chemical industrialisation on an added-value basis to total exports was 38 % in 1973, 39 % in 1975 and 43 % in 1978. In Japan comparable ratios were 59 % in 1960, 56 % in 1965 and 60.0 % in 1970. Korea also shows similar differences when compared with the U.S., West Germany and the United Kingdom. When the year in which Korean exports reached US $ 10 bn (current value) is compared with

Japan, West Germany and Taiwan in the year when each of these countries, respectively, achieved the same level of exports, Korea showed far lower levels of industrialisation (see Table 7.22).

TABLE 7.22

Ratios of Industrialisation (Selected Countries, Selected Years)

Unit: %

Item Year	Country	Ratio of Industrial-isation	Ratio of Heavy-Chemical Industrialisation	Ratio of Heavy Industrial-isation
1977	Korea	28.7	41.6	25.3
1977	Taiwan	30.4	53.2	25.7
1967	Japan	32.5	65.3	47.4
1960	West Germany	42.1	65.3	51.6

Source: Korea, The Main Business Index, The Economic Planning Board, 1978.

Japan, Industrial Statistical Table, The Ministry of Trade, 1967.

Taiwan, National Income of the Republic of China, 1977.

West Germany, Statistisches Jahrbuch, Statistisches Bundesamt, 1962.

Note : For each country the relevant year is the year when exports is reached US $ 10 bn.

The Low Level of Technology and R & D (Software)

Korea has yet to lose the status of being a technologically under-developed country, and a prime requirement is for Korea to actively promote her own technological development and to introduce high-grade technologies from the developed countries. However, advanced countries have recently raised the barrier of technology protectionism.

The amount of investment in developing scientific technology in

Korea as a percentage of GNP was 0.85 % in 1978 and 0.83 % in 1979. In Japan, the United States and the United Kingdom the ratios were 1.76 % (in 1975), 2.29 % (in 1975) and 2.10 % (in 1972), respectively, and the Soviet Union recorded 4.80 % (in 1975) (see Table 7.23). Table 7.23 demonstrates the relatively low commitment of funds in Korea to investment in science and technology.

The main reasons why Korean technology remains backward are a) the low level of funds which businesses have voluntarily invested in technological development and b) the Korean government took the initiative in this field in a manner which appears to have substituted for instead of complementing private initiative.

TABLE 7.23

Expenditure on Scientific Technology: Korea and Selected Countries

Country	Investment in Scientific Technology (as % of GNP)	Number of Researchers (per 10 thousand head of population)	Research Funds (per one researcher, US $)
U.S.A.	2.29 (1975)	25.2 (1976)	68,960 (1976)
U.K.	2.10 (1972)	13.8 (1972)	-
Japan	1.76 (1975)	24.1 (1976)	38,100 (1976)
W. Germany	2.36 (1974)	16.9 (1976)	99,710 (1976)
U.S.S.R.	4.80 (1975)	49.0 (1976)	18,920 (1976)
Korea	0.85 (1978)	3.3 (1976)	10,790 (1976)

Source: The Ministry of Science and Technology, Seoul, Korea.
Japan, Scientific Technology White Paper, 1976.

7.4.3 PROBLEMS ASSOCIATED WITH OVERSEAS CONSTRUCTION EXPORTS FROM KOREA

The primary purpose of investigating problems associated with overseas construction exports from Korea is to suggest strategic options available to improve performance.

Owing to the work ethic in Korea, inexpensive wages, a supportive and growth oriented government and an aptitude for new ventures, Korea managed to increase her overseas construction exports from around US $ 2.5 bn in 1976 to peak levels of over US $ 13.0 bn in both 1981 and 1982. However, since then, construction exports from Korea have fallen back to US $ 2.1 bn (1987).

Various reasons accounted for this inability to sustain growth. First, because demand was spasmodic and the production base of the contractor highly mobile, the Korean contractors failed to serve several markets simultaneously using both exporting and FDI. In contrast, they became too heavily dependent on the Middle-East market from 1980 and, in failing to diversify their export markets, became over-exposed to the risks of international construction (technical risks, financial risks, political risks, logistical risks and construction risks). In effect, Korean companies did not utilise their ownership advantages to any greater extent than that of operating in only one market, and they had to suffer a far sharper decrease in their export values than more diversified exporting countries when the Middle-East market collapsed. (Labour demand has dropped from 170,000 at its peak to around 100,000 in the Middle-East). The problems of Korea's construction firms were increased by the emergence of counter-trading, e.g. payments by some countries with oil instead of cash. In general, an important problem which the overseas construction industry in Korea needs to confront is how to diversify, thus reducing the current level of dependence of the Middle-East.

Second, Korea now faces growing competition for simpler engineering jobs from "low-wage" countries such as India, Pakistan, Bangladesh and Turkey. For example, construction workers' monthly earnings in the Middle-East at the end of 1981 was US $ 1,210 for Koreans, US $ 660 for Indians, US $ 540 for Pakistanis and US $ 430 for Bangladeshis (Asian Wall Street Journal, 4th October 1982, pp 5). In response, Korean construction companies made use of cheaper labour from Sri Lanka, Malaysia, Thailand and the Philippines. Nevertheless, their profit margins decreased from 15.0 % of contract value in 1978 to 5.0 % in 1981. Some Korean businesses often made such low bids that they consequently folded before contracts were completed. Other Asian nations are entering the construction market, adding to the number of competing firm. Several of the new markets for basic engineering products and services that Korea has been investigating internationally have shown little interest due to the relatively high wage levels of Korean employees. Therefore, Korean companies, it would appear, should aim for higher value-added work and invest more in R & D in order to win more contestable bids.

Third, new global market trends are moving towards technology competition and away from price competition. But Koreans still lack the necessary engineering skills to compete in these markets. Thus, it will be difficult for Korean contractors to advance into the developed regions such as Europe, Canada and the United States without high technology accumulation. For example, most of the 53 Korean construction companies at work on construction projects in 35 different countries would be unable to complete complicated construction projects without foreign know-how (Financial Times: London Edition, 8th January 1985, pp. 4). As shown in Table 7.23 in the previous section, Korean R & D investment in scientific technology has fallen very much behind the technologically developed countries such as the United States, the United Kingdom, Japan and West Germany. Therefore, Korean overseas contractors, which once thrived on the basis of cheap labour, will need to become orientated towards technological innovation if they wish to remain competitive.

Fourth, the often competitive bidding between rival Korean firms has been compounded by a reputation for poor-quality construction. This is also a problem associated with overseas construction exports from Korea.

Finally, in recent years financial arrangements such as exports on D/A (document against acceptance) and D/P (document against payment) and on deferred payments have become commonplace due to a large increase in the nominal value of contracts (resulting from the accelerated general inflation of prices) for construction exports and to a worsening in the shortage of foreign exchange in importing countries. It is important, therefore, for Korea to achieve a competitive edge in exports on deferred payments, long or mid-term, something which could be financed by an increase in the domestic savings ratio or by foreign loans. However, Korean contractors are placed at a disadvantage in the area of "financial support" such as suppliers' and buyers' credit compared with their trading rivals. An important consideration in the case of deferred payment contracts is an awareness of political risks giving rise to contract default. In fact, the value of contract default in overseas construction exports (largely in the Middle-East and South-East Asia) was over US $ 2.2 bn by the end of 1985. Bank guarantees, which covered projects representing over 11 % of GNP at the end of 1981, greatly exposed the Korean economy to the risk of collapse. Korean banks, on occasion, have had to force troubled companies to sell assets in return for emergency funding and loan rescheduling.

Strategic options available to solve these problems associated with plant and overseas construction exports will be presented in Chapter 12.

7.5 CONCLUSION

Korea is increasingly subject to international competition from low-wage countries. As a result, plant and overseas construction exports value have dramatically decreased since 1985 and 1982, respectively. Korea's work values, inexpensive wages, and a sympathetic government's support for promising new ventures has propelled Korea in past years to second place in the international construction league table. However, there have been problems.

In the Middle-East and African markets there was often competitive bidding between rival Korean firms, and a reputation for poor-quality construction. Thus, the Korean government had to restrict some contractors from bidding on overseas jobs and insisted that companies seek projects only if they were sure to be profitable. The Korean government also designed a new contract ceiling system for construction projects to prevent overheated competition.

Strategic options to improve performance might include a move to higher value-added work and increased investment in R & D to generate technological renovation, and design and construction activities which incorporate updated technologies in electronics, machinery and new materials.

To facilitate technological development by Korean contractors, the Korean government may well consider a change in the current bidding system, which is based largely on the companies' contract performance, towards one which reflects their technological and quality standards.

Korean contractors might also consider market diversification into communist countries, such as the Soviet Union and China, in line with the government's "Northern policy". They are expected to advance into the U.S. and Japanese construction markets. Iran and Iraq have promised to give priority to Korean firms for their willingness to continue with projects during the war, when bidding for post-war rehabilitation projects. Therefore, the Korean government should be more willing to play a supporting role, not only in encouraging market diversification from the Middle-East market to other regions but also in financing Korean contractors who want to participate in Iraq's and Iran's reconstruction projects. However, OPEC countries, whose high debts in any event have led to a fall in the number of contracts, prefer to pay with oil instead of cash. This movement towards counter-trade will require an understanding of the implications of this type of contract.

NOTE

1. To understand the terms D/A and D/P clearly, Article 10 of the Uniform Rules for Collection define them as follows: In respect of documentary collection, including a bill of exchange payable at a future date, the collection order should state whether the commercial documents are to be released to the drawee against acceptance (D/A) or against payment (D/P). In the absence of such a statement, the commercial documents will be released only against payment.

CHAPTER 8

AN ANALYSIS OF SUCCESSES AND FAILURES AMONG TENDERS FOR PLANT EXPORTS / OVERSEAS CONSTRUCTION PROJECTS

This chapter employs a) factor analysis to focus on factors influencing, respectively, successes and failures among tenders for plant and construction exports and b) discriminant analysis to compare Korea with developed countries in this regard.

A model is developed to explain bid success or failure (the dependent variable) with firm size and qualitative factors such as technology, price competitiveness, financial arrangements and mutual cooperation between exporting and importing countries (the independent variables).

First, however, comparisons between Korea and developed countries are made with respect to firm size, market share, firms' objectives and major export regions.

Thus, this chapter falls naturally into five sections:

8.1 A comparison between Korea and developed countries.

8.2 Factors assotiated with, respectively, the successes and failures among tenders for plant and construction exports.

8.3 Success and failure factors associated with tenders for Korean construction exports.

8.4 Regression models of success and failures of tenders for plant and construction exports.

8.5 Summary and conclusions.

8.1 A COMPARISON OF KOREA AND DEVELOPED COUNTRIES WITH REGARD TO FIRM SIZE, MARKET SHARE, FIRM OBJECTIVES AND MAJOR EXPORT REGIONS

Section one of this chapter presents and discusses the findings of this survey with respect to a) a comparison of firm size, market share, firm objectives and major export regions between Korea and developed countries and b) a comparison between plant and construction export firms. This section also presents and discusses a comparison of firm size with regard to firms' objectives, market share and major export regions. The statistical tools used in this section are cross-tabulation and Pearson correlation.

8.1.1 A COMPARISON OF FIRM SIZE, MARKET SHARE, FIRMS' OBJECTIVES AND MAJOR EXPORT REGIONS BETWEEN KOREA AND DEVELOPED COUNTRIES

In this sub-section, weighted mean scores are presented and discussed to compare firm size, market share, firms' objectives and major export regions between Korea and developed countries' plant and construction export firms.

8.1.1.1 FIRM SIZE

Bilkey and Tesar(1977) have suggested that the influence of firm size is relatively unimportant for an explanation of export behaviour when account is taken of the quality and dynamism of management. Their study indicated that small and medium-sized firms can export as successfully as large firms. Cavusgil(1981) has also suggested that the size of firm, as measured by the number of full-time employees, has no impact on a firm's increasing commitment over time to greater internationalisation. However, he qualified his conclusion by noting that since firm size is usually correlated with the availability of resources, quality and dynamism of management and other variables, size has an indirect effect on export behaviour, influencing the timing of a firm's entry into export markets and its resource commitment.

TABLE 8.1

A COMPARISON OF KOREA AND DEVELOPED COUNTRIES WITH REGARD TO FIRM SIZE IN THE PLANT AND CONSTRUCTION INDUSTRY (SAMPLE DATA IN 1987)

Variable	Korea (A)	Developed Countries (B)	A/B x 100 (%)
a. Number of Employees (persons)	3,541	5,773	61.3
b. Issued Share Capital (USM$)	71.3	107.2	66.5
c. Sales Volume in 1986 (USM$)	446.0	1,467.2	30.4
d. Ratio of R & D Expenditure to Sales Volume in 1986 (%)	1.41	1.78	79.2
c/a (USM$/person)	0.126	0.254	49.6
c/b	6.255	13.686	45.7

Source: Calculated from the output of SPSS (Cross-tabulation program) for question No.2.

Note: (A) represents an average of 42 companies.
(B) represents an average of 17 companies in 8 countries.

As can be seen from Table 8.1, the number of employees and issued share capital of Korean plant and construction export companies in 1986 amounted to about 60.0% of those of developed countries and sales volume to about 30%. In other words, sales volume per employee and the ratio of issued share capital to sales volume of Korean firms amounted to about 50% of those of developed countries, indicating, prima facie, that labour productivity of the more labour intensive Korean firms is inferior to that of developed countries.

The findings of this survey, however, support the suggestion of Bilkey and Tesar(1977), who argued that exporting is not limited to large firms because sales volume per employee and the ratio of issued share capital to sales volume of small and medium-sized firms (Korea) amounted to about half of those of large firms (developed countries). This findings, pointing to an inferior labour productivity of Korean firms compared with developed countries, suggest that Korean plant and construction export companies should improve their labour productivity and reduce unnecessary employees to increase sales volume per employee. This findings also suggest that Korean plant and overseas construction export companies should use their issued share capital more effectively to increase the ratio of issued share capital to sales volume by withdrawing resources from less productive activities because, as shown in Table 8.1, the ratio of issued share capital to sales volume of Korean firms in 1986 amounted to 45.7% of that of developed countries.

Table 8.1 also shows that Korean plant and construction export firms have a lower ratio of R & D expenditure to sales volume.

8.1.1.2 MARKET SHARE

As can be seen from Table 8.2, the developed countries (represented by eight countries and 17 companies) share their markets equally between local and foreign markets. In contrast, the 42 Korean companies are seen to depend more on foreign markets and export performance than on the domestic market and, in consequence, are more vulnerable than their competitors in the sample to fluctuations in world demand.

TABLE 8.2

A COMPARISON OF KOREA AND DEVELOPED COUNTRIES' LOCAL AND FOREIGN MARKET SHARE IN THE PLANT AND CONSTRUCTION INDUSTRY

Variable Number	Market	Weighted Mean Score		
		Korea (a)	Developed Countries (b)	Average
V24	Local Market	2.33	2.63	2.42
V25	Foreign Market	2.70	2.63	2.68

Source: Calculated from the output of SPSS (Cross-tabulation program) for question No.4. Calculation of the above figures was based on multiplying the frequency count of each value (scale) by weights given to these values: 4 (70% and over), 3 (between 50% and 70%), 2 (between 20% and 50%) and 1 (less than 20%).

Note: (a) 42 companies

(b) 8 countries, 17 companies.

8.1.1.3 FIRM OBJECTIVES

As shown in Tables 8.3, 8.4 and 8.5, both Korean plant and construction companies and those of developed countries rank profit growth, gross profit and capacity utilisation as the three major objectives. In addition, Korean firms gave a high ranking to the pursuit of labour productivity and sales growth. This reflects an awareness among Korean firms that their labour productivity (sales volume per employee) is only half of that in developed countries (see Table 8.1).

TABLE 8.3

FIRM OBJECTIVES IN THE PLANT AND CONSTRUCTION INDUSTRY:
A COMPARISON BETWEEN KOREA AND DEVELOPED COUNTRIES

Variable Number	Factors	Weighted Mean Score		
		Korea	Developed Countries	Average
V11	Gross profit	4.63(2)	4.63(1)	4.63(1)
V12	Profit growth	4.76(1)	4.31(2)	4.63(1)
V13	Return on investment	3.73(6)	3.88(5)	3.77(6)
V14	Sales growth	4.14(5)	3.87(7)	4.07(5)
V15	Market share	3.73(6)	3.88(5)	3.77(6)
V16	Market share growth	3.54(8)	3.69(8)	3.58(8)
V17	Capacity utilisation	4.23(3)	4.19(3)	4.21(3)
V18	Labour productivity	4.18(4)	3.94(4)	4.11(4)

Note: Figures in brackets indicate ranking according to relative importance.

Source: Calculated from the output of SPSS (Cross-tabulation program) for question No.3. Calculation of the above figures was based on multiplying the frequency count of each value (scale) by weights given to these values: 5 (very important), 4 (important), 3 (of some importance), 2 (of limited importance) and 1 (of no importance).

Table 8.4 and 8.5 show that both Korean and developed country firms regard return on investment, market share and market share growth to be moderately important objectives, but relative to Korean firms, competitors consider labour productivity and sales growth to be less important objectives.

TABLE 8.4

FIRM OBJECTIVES RANKED BY 42 KOREAN PLANT AND CONSTRUCTION COMPANIES

FACTORS	MEAN SCORES
FACTORS OF GREAT IMPORTANCE (4.00-5.00)	
Profit Growth	4.76
Gross Profit	4.63
Capacity Utilisation	4.23
Labour Productivity	4.18
Sales Growth	4.14
FACTORS OF MODERATE IMPORTANCE (3.00-4.00)	
Return on Investment	3.73
Market Share	3.73
Market Share Growth	3.54

Source: TABLE 8.3

TABLE 8.5

FIRM OBJECTIVES RANKED BY 17 PLANT AND CONSTRUCTION COMPANIES IN EIGHT DEVELOPED COUNTRIES

FACTORS	MEAN SCORES
FACTORS OF GREAT IMPORTANCE (4.00-5.00)	
Gross Profit	4.63
Profit Growth	4.31
Capacity Utilisation	4.19
FACTORS OF MODERATE IMPORTANCE (3.00-4.00)	
Labour Productivity	3.94
Return on Investment	3.88
Market Share	3.88
Sales Growth	3.87
Market Share Growth	3.69

Source: TABLE 8.3

8.1.1.4 FIRMS' MAJOR EXPORT REGIONS

Tables 8.6, 8.7 and 8.8 give a comparison of Korea and developed countries with respect to major export regions(MER) in the plant and construction exports.

TABLE 8.6

A COMPARISON OF KOREA AND DEVELOPED COUNTRIES WITH REGARD TO MAJOR EXPORT REGIONS(MER) IN THE PLANT AND CONSTRUCTION EXPORTS

Variable Number	Export Regions	Weighted Mean Score		
		Korea	Developed Countries	Average
V26	U S A	4.06(3)	3.29(5)	3.84(3)
V27	E E C	2.50(7)	3.17(6)	2.68(6)
V28	Mediterranean Countries	2.37(8)	3.09(7)	2.56(8)
V29	Middle-East	4.20(2)	4.21(1)	4.20(2)
V30	Newly Industrialised Countries(NICs)	3.79(4)	3.43(4)	3.68(4)
V32	Africa	3.33(5)	4.00(2)	3.60(5)
V33	South-East Asia	4.43(1)	3.67(3)	4.33(1)
V35	Latin America	3.00(6)	2.33(8)	2.60(7)

Note: Figures in brackets indicate ranking according to relative importance.

Source: Calculated from the output of SPSS (Cross-tabulation program) for question No.5. Calculation of the above figures was based on multiplying the frequency count of each value (scale) by weights given to these values: 6 (only market), 5 (the main but not sole market), 4 (the second most important market), 3 (the third most important market), 2 (the fourth most important market) and 1 (the fifth most important market).

TABLE 8.7

MAJOR EXPORT REGIONS RANKED BY 42 KOREAN PLANT AND CONSTRUCTION FIRMS

EXPORT REGION	MEAN SCORES
REGIONS OF GREAT IMPORTANCE (4.00-6.00)	
South-East Asia	4.43
Middle-East	4.20
U S A	4.06
REGIONS OF MODERATE IMPORTANCE (3.00-4.00)	
Newly Industrialised Countries(NICs)	3.79
Africa	3.33
Latin America	3.00
REGIONS OF LESS IMPORTANCE (1.00-3.00)	
E E C	2.50
Mediterranean Countries	2.37

Source: TABLE 8.6.

TABLE 8.8

MAJOR EXPORT REGIONS RANKED BY 17 PLANT AND CONSTRUCTION COMPANIES IN EIGHT DEVELOPED COUNTRIES

EXPORT REGIONS	MEAN SCORES
REGIONS OF GREAT IMPORTANCE (4.00-6.00)	
Middle-East	4.21
Africa	4.00
REGIONS OF MODERATE IMPORTANCE (3.00-4.00)	
South-East Asia	3.67
Newly Industrialised Countries(NICs)	3.43
U S A	3.29
E E C	3.17
Mediterranean Countries	3.09
REGIONS OF LESS IMPORTANCE (1.00-3.00)	
Latin America	2.33

Source: TABLE 8.6.

Both Korea (2nd ranked) and developed countries (1st ranked) regard the Middle-East as an important export region, with developed country firms showing a stronger commitment to the Middle-East. Korean plant and construction export firms show a stronger commitment to South-East Asia and USA, and developed country firms to Africa. Apart from this, the overall pattern shows a marked similarity between the two groups. The differences can be attributed to psychic distance (similarities in cultural, business and customs), which gives Korean firms location-specific advantages in the South-East Asia market and developed country firms in Africa. In the case of the USA market, Korea and USA have enjoyed close political and diplomatic relations and mutual economic co-operation (trade, joint-ventures, loans and technology supply) since World War Two, and since then the USA has allowed a preferential tariff until recently on Korean exports. Because Korea can no longer enjoy a tariff preference from the USA, Korean plant export firms should be encouraged to diversify their export market from the USA to the EEC, Latin America and Africa regions, all of which have tended to be neglected by Korean firms. Indeed, Korean government and business firms have accelerated their export performance in Europe since the Korean president, Mr. Chun, visited Europe in April 1986.

8.1.2 A COMPARISON OF FIRM SIZE WITH REGARD TO FIRM OBJECTIVES, MARKET SHARE AND MAJOR EXPORT REGIONS

In this sub-section, the significantly correlated variables between firm size and firm objectives, market share and major export regions are presented and discussed, followed by group comparisons (a) between Korea and developed countries and (b) between plant and construction export firms.

8.1.2.1 BETWEEN KOREA AND DEVELOPED COUNTRIES

Tables 8.9 and 8.10 show the correlations of firm size with regard to the objectives, market share and major export regions (MER) of the 42 Korean plant and construction firms and the 17 plant and construction firms in the eight developed countries.

Issued share capital is moderately correlated with the number of employees (0.463) in both groups, and sales growth and capacity utilisation are inversely correlated with the number of employees in both groups. In other words, small-sized firms, as measured by the number of employees, regard sales growth and capacity utilisation as their important firm objectives insofar as these objectives are inversely correlated with the number of employees in both groups. Large-sized firms appear to consider them to be less important firm objectives.

Tables 8.9 and 8.10 also show that market share, market share growth, and EEC and NIC markets are inversely correlated with the number of employees (except for EEC in the case of Korea). However, in developed countries, sales volume and local market share are moderately correlated with the number of employees within the 95.0 % level. In the Korean plant and construction industry, small-sized firms signify that market share, market share growth and the NIC markets are important, but that the EEC is a less important market compared with large firms (see Table 8.9). In developed countries, small-sized firms demonstrate that sales volume and local market share are less important, but foreign market share is more important compared with large-sized firms.

TABLE 8.9

THE CORRELATIONS OF FIRM SIZE WITH REGARD TO FIRM OBJECTIVES, MARKET SHARE AND MAJOR EXPORT REGIONS OF 42 KOREAN PLANT AND CONSTUCTION FIRMS

Correlated	Variables	Pearson Correlation		
		Coefficient	Case	P
	Issued share capital	0.463	39	0.001
	Sales growth	-0.296	39	0.034
	Market share	-0.303	39	0.030
Number of Employees by	Capacity utilisation	-0.504	38	0.001
	Market share growth	-0.306	39	0.029
	EEC (MER)	0.312	30	0.047
	NICs (MER)	-0.292	33	0.049
	Labour productivity	-0.502	36	0.001
Sales Volume in 1986 by	Local market share	-0.514	37	0.001
	Foreign market share	0.585	38	0.001
	USA (MER)	0.343	33	0.026
	Market share growth	0.367	29	0.025
	Sales growth	0.308	29	0.052
Ratio of R&D to Sales by	Middle-East (MER)	-0.375	29	0.023
	EEC (MER)	0.441	20	0.023

Source: Calculated from the output of SPSS(Pearson Correlation Program) for question No.2 to No.5. Correlation of the above variables was based on real raw data (firm size) and the value (scale) by weights given to these values as in Tables 8.2, 8.3 and 8.6 (market share, firm objectives and major export regions).

TABLE 8.10

THE CORRELATIONS OF FIRM SIZE WITH REGARD TO MARKET SHARE, FIRM OBJECTIVES AND MAJOR EXPORT REGIONS (MER) OF 17 PLANT AND CONSTRUCTION FIRMS IN THE EIGHT DEVELOPED COUNTRIES

Correlated	Variables	Pearson Correlation Coefficient	Cases	P
Number of Employees by	Issued share capital	0.463	12	0.065
	Sales volume in 1986	0.440	15	0.050
	Sales growth	-0.434	15	0.053
	Capacity utilisation	-0.627	15	0.006
	Local market share	0.534	15	0.020
	Foreign market share	-0.408	15	0.066
Issued Share Capital by	Labour productivity	-0.404	13	0.086
	Middle-East (MER)	-0.639	13	0.009
	NICs (MER)	-0.526	11	0.048
Sales Volume in 1986 by	Profit growth	0.393	16	0.066
	Local market share	0.643	16	0.004
	Foreign market share	-0.668	16	0.002
	USA (MER)	0.469	13	0.053
Ratio of R&D to Sales by	Foreign market share	0.508	8	0.099
	NICs (MER)	-0.742	7	0.028

Source: Table 8.9.

Our interpretation of this data is that large-sized firms in developed countries favour the domestic market more than foreign markets. However, no significant correlation appears in Table 8.9 between the number of employees and sales volume in Korean firms, suggesting that small-sized firms can sell their products as successfully as large-sized firms, and that large-sized firms could reduce their number of employees without decreasing their sales volume, thus improving their labour productivity.

As can be seen from Table 8.10, issued share capital is inversely correlated with labour productivity (-0.404), the Middle-East (-0.639) and NICs (-0.526) in developed countries. But there are no correlations between issued share capital and other variables in Korea (see Table 8.9).

Tables 8.9 and 8.10 also show that sales volume is correlated with local market share, foreign market share and the USA in both groups. However, there is an interesting point with regard to market share. That is to say, the firms with large sales volume in Korea sold their products more in foreign markets (0.585) than in the domestic market. But the firms with large sales volume in the developed countries sold their products more in their domestic market than in foreign markets. Thus, large-sized plant and consttruction export firms in Korea appear to be more dependent upon foreign markets than are their competitors in the developed countries.

As shown in Table 8.9 and 8.10, there are no common variables which are correlated with the ratio of R & D expenditure to sales volume in both Korea and developed countries. In the former, the firms which have a high ratio of R & D to sales regard the EEC as an important market. In the latter, the firms which have a high ratio of R & D to sales sell their products more in foreign markets than in the local market, indicating the relevance of a high ratio of R & D expenditure to sales volume on export performance and international competitive power.

Table 8.10-1 shows the ratio of business R & D expenditure to turnover by country. R & D in Korea is about one-third of the ratio in Japan, one-fifth of West Germany's and one-sixth of the ratio in France.

This low R & D ratio represents a major cause of Korea's low technological level and its failure to achieve advanced country status. The precision machinery sector, the latest technological industry, showed the highest R & D ratio of 2.16%, and the electronic industry and general machinery also out-performed the industrial average. It is proposed to examine in this thesis the relationship between R & D and technology intensiveness, and the extent to which R & D expenditure provides a key to greater competitiveness.

TABLE 8.10-1

THE RATIO OF BUSINESS R & D EXPENDITURE TO TURNOVER BY COUNTRY

Unit: %

Country Section	Korea ('81)	U.S.A. ('79)	Japan ('80)	West Germany ('77)	France ('75)
Total Industry	0.54	---	1.5	2.7	3.0
Manufacturing Industry	0.67	3.1	1.7	3.2	---
Chemical Industry	0.52	3.5	2.6	4.5	3.6
Machinery Industry	0.97	5.0	1.9	2.7	2.6
Electric and Electronics Industry	1.73	6.4	3.7	7.3	7.9
Precision Machinery Industry	2.16	6.2	3.0	5.0	4.3
Automobile Industry	0.51	3.8	2.4	2.5	2.4

Source: The Ministry of Science and Technology, Seoul, Korea.

Tables 8.11 and 8.12 show the correlations of firm size with regard to firm objectives, market share and major export regions (MER) in 62 international plant and construction firms of 12 countries and in 45 firms in four Newly Industrialised Countries(NICs). The data allows us to compare 42 Korean plant and construction firms with three NIC plant and construction firms in Turkey, Taiwan and Singapore, respectively.

TABLE 8.11

THE CORRELATIONS OF FIRM SIZE WITH REGARD TO FIRM OBJECTIVES AND MAJOR EXPORT REGIONS(MER) IN 62 INTERNATIONAL PLANT AND CONSTRUCTION FIRMS

Correlated	Variables	Pearson Correlation Coefficient	Cases	P
Number of Employees by	Issued share capital	0.477	54	0.001
	Sales volume in 1986	0.405	56	0.001
	Sales growth	-0.311	57	0.009
	Market share	-0.238	57	0.037
	Capital utilisation	-0.443	56	0.001
	Middle-East (MER)	-0.257	58	0.026
	NICs (MER)	-0.310	45	0.019
Issued Share Capital by	Capital utilisation	-0.273	53	0.024
	Middle-East (MER)	-0.239	55	0.039
	South-East Asia(MER)	-0.408	24	0.024
Sales Volume in 1986 by	Labour productivity	-0.326	54	0.008
	USA (MER)	0.257	47	0.041
	Middle-East (MER)	-0.248	57	0.031
Ratio of R&D to Sales by	Market share growth	0.318	39	0.024
	Middle-East (MER)	-0.339	39	0.017
	EEC (MER)	0.405	27	0.018

Source: Calculated from the output of SPSS(Pearson Correlation Program) for question No. 2 to No. 5. Correlation of the above variables was based on real raw data (firm size) and each value (scale) by weights given to these values, as in Tables 8.2, 8.3 and 8.6.

TABLE 8.12

THE CORRELATIONS OF FIRM SIZE WITH REGARD TO FIRM OBJECTIVES, MARKET SHARE AND MAJOR EXPORT REGIONS(MER) OF 45 PLANT AND CONSTRUCTION FIRMS IN THE FOUR NEWLY INDUSTRIALISED COUNTRIES (NICs)

Correlated	Variables	Pearson Correlation		
		Coefficient	Cases	P
	Issued share capital	0.435	42	0.001
Number of Employees by	Capacity utilisation	-0.448	41	0.002
	NICs (MER)	-0.292	33	0.049
Issued Share Capital by	Capacity utilisation	-0.251	40	0.059
	Labour productivity	-0.461	38	0.002
Sales Volume in 1986 by	Local market share	-0.505	39	0.001
	Foreign market share	0.574	40	0.001
	Market share growth	0.412	31	0.011
Ratio of R&D to Sales by	Middle-East (MER)	-0.362	31	0.023
	EEC (MER)	0.527	21	0.023

Source: Calculated from the output of SPSS (Pearson Correlation Program) for question No. 2 to No. 5.

As shown in Table 8.9 and 8.12, there is no correlation between the number of employees and market share, sales growth and the EEC (MER) in the four NICs. But there is an inverse correlation (-0.251) between issued share capital and capacity utilisation. The absence of correlation between sales volume and USA (MER) for the NICs shows them to be less dependent on the USA market than is Korea.

8.1.2.2 BETWEEN PLANT AND CONSTRUCTION EXPORT FIRMS

Table 8.13 and 8.14 show the correlations of firm size with regard to firm objectives, market share and major export regions of 19 plant export firms and 24 construction export firms, respectively.

Firstly, comparing the number of employees with other variables for the two industries, plant export firms are more strongly correlated with issued share capital (0.915) than construction export firms (0.447), indicating that the plant industry is the more capital intensive of the two sectors. Among construction export firms, size is moderately correlated with sales volume (0.586) but for plant export firms there is no correlation. That is to say, the bigger construction firms are (by number of employees), the relatively greater is their sales volume. The smaller-sized construction export firms demonstrate a clear preference for the Middle-East (-0.456), but for plant export firms there is no correlation.

Secondly, comparing issued share capital with other variables between the two sectors, plant export firms are inversely correlated with market share (-0.578) and market share growth (-0.413). However, construction export firms are positively correlated with sales volume (0.314). Among the larger-sized plant export firms, market share and market share growth are less important objectives. In the construction industry, small firms in terms of number of employees and issued share capital sell relatively less product. However, in the plant industry, there are no correlations between these size variables and sales volume. Not surprisingly, therefore, in the plant industry, large-sized firms regard higher labour productivity as an important objective (0.448). But in the construction industry, large-sized firms are less concerned with labour productivity (-0.406).

Thirdly, comparing sales volume in 1986 with foreign market share between the two sectors, plant export firms are positively correlated (0.540) and construction export firms are inversely correlated with foreign market share (-0.427). In other words, the plant sector showed itself to be more export oriented.

TABLE 8.13

THE CORRELATIONS OF FIRM SIZE WITH REGARD TO FIRM OBJECTIVES, MARKET SHARE AND MAJOR EXPORT REGIONS OF 19 PLANT EXPORT FIRMS IN 5 COUNTRIES

Correlated	Variables	Pearson Correlation		
		Coefficient	Cases	P
	Issued share capital	0.915	16	0.001
	Sales growth	-0.424	17	0.045
Number of Employees by	Market share	-0.595	17	0.006
	Market share growth	-0.488	17	0.023
	Labour productivity	0.402	17	0.055
	Sales growth	-0.460	16	0.036
	Labour productivity	0.448	16	0.056
Issued Share Capital by	Market share	-0.578	16	0.010
	Market share growth	-0.413	16	0.056
	EEC (MER)	0.413	16	0.056
	Market share	-0.409	17	0.052
Sales Volume in 1986 by	Local market share	-0.451	16	0.040
	Foreign market share	0.540	17	0.013
	Labour productivity	-0.669	17	0.002
	Return on investment	0.626	10	0.026
Ratio of R&D to Sales by	Market share growth	0.534	10	0.056
	Capacity utilisation	0.560	9	0.058
	EEC (MER)	0.484	10	0.078

Source: Calculated from the output of SPSS(Pearson Correlation Program) for question No. 2 to No. 5.

Finally, comparing the ratio of R & D expenditure to sales volume with major export regions between the two sectors, plant export firms correlated with the EEC (0.484), and construction export firms correlated inversely with Africa (-0.882). Thus, plant exporters with high ratios of R & D expenditure to sales volume, regard the EEC as an important export region. In contrast, construction exporters with high ratios of R & D expenditure to sales volume were biased against Africa.

TABLE 8.14

THE CORRELATIONS OF FIRM SIZE WITH REGARD TO FIRM OBJECTIVES, MARKET SHARE AND MAJOR EXPORT REGIONS OF 24 CONSTRUCTION FIRMS IN 12 COUNTRIES

Correlated	Variables	Pearson Correlation		
		Coefficient	Cases	P
	Issued share capital	0.447	21	0.021
	Sales volume in 1986	0.586	23	0.002
	Sales growth	-0.322	23	0.067
Number of Employees by	Capacity utilisation	-0.493	23	0.008
	Local market share	0.481	24	0.009
	Labour productivity	-0.472	21	0.015
	Middle-East (MER)	-0.456	24	0.013
	Sales volume in 1986	0.314	20	0.089
Issued Share Capital by	Capacity utilisation	-0.451	20	0.023
	Labour productivity	-0.406	18	0.047
	Middle-East (MER)	-0.400	23	0.029
	Labour productivity	-0.397	20	0.042
Sales Volume in 1986 by	Local market share	0.474	23	0.011
	Foreign market share	-0.427	23	0.021
	NICs (MER)	0.361	15	0.093
	Gross profit	-0.540	16	0.015
Ratio of R&D to Sales by	Market share growth	0.373	16	0.077
	Africa (MER)	-0.882	5	0.024

Source: Calculated from the output of SPSS (Pearson Correlation Program) for question No. 2 to No. 5.

8.1.3 A COMPARISON OF FIRM OBJECTIVES, MARKET SHARE AND MAJOR EXPORT REGIONS REGARDING PLANT AND CONSTRUCTION EXPORT FIRMS

In this sub-section, the significantly correlated variables among firm size, firm objectives, market share and major export regions are presented and discussed for mutual comparison, together with group comparisons (a) between Korea and developed countries and (b) between plant and construction export firms.

8.1.3.1 BETWEEN KOREA AND DEVELOPED COUNTRIES

Table 8.15 and 8.16 show the correlations among firm objectives, market share and major export regions of the 42 Korean plant and construction firms and of the 17 plant and construction firms in the eight developed countries, respectively. Correlations which are common to both groups are as follows: return on investment, sales growth, market share, capacity utilisation, local market share and the Middle-East. Eight variables are significantly correlated in only one or other of the two groups, namely, profit growth, labour productivity, USA(MER), NICs (MER), Africa (MER), market share growth and foreign market share.

Among the common variables, the return on investment objective is moderately correlated with the objective of market share growth. In developed countries, the firms which regard return on investment as an important objective sell their products more in local than in foreign markets (return on investment is inversely correlated with foreign market share (-0.567)), but in Korea, return on investment shows no correlation with foreign market share. However, Korean firms which regard return on investment as an important firm objective identified Africa as their most important export region (coefficient: 0.875). In contrast, developed country firms identified the USA as their most important export region (coefficient: 0.645).

Korean and developed countries' firms which regard sales growth as an important firm objective stated that market share growth is also important. But the correlation between market share and market share growth is stronger in Korea than in developed countries.

Capacity utilisation is inversely correlated with the USA (-0.474) for Korean firms but directly correlated(0.502) for developed countries. Thus, Korean firms to whom capacity utilisation is very important view the USA as a less important export region, whereas developed country firms which consider capacity utilisation to be very important regard the USA as a very important export region. In addition to the USA, the latter also see the EEC (0.559) and Mediterranean countries (0.700) as very important export regions.

In both groups local market share is strongly inversely correlated with foreign market share, at -0.942 and -0.843, respectively, demonstrating a marked preference for one market sector over the other. Among developed country firms, local market share is moderately correlated with the USA but not among Korean firms. Thus, firms in developed countries which sell their products more in the local market regard the USA as a their important export region.

In Korean firms, the Middle-East is inversely correlated with the EEC (-0.538) and the USA (-0.389), but in developed country firms this market correlates directly with NICs (0.545) and inversely with the USA (-0.515). In other words, Korean firms which consider the Middle-East to be a very important market regard the EEC and the USA as less important export regions. In fact, Korean construction firms won a total of US$ 51.8 billion in foreign contracts from 1980 to 1985, and the Middle-East has been a favourite market of Korean contractors in recent years, accounting for 70.1 % of their total construction export volume. This result could be attributed to a combination of a major country-specific factor (ready access to a pool of cheap labour which is permitted to substitute working overseas for an international contractor for service in the Armed forces) and a firm-specific advantage (the supply of cheap labour in Korea until 1982).

However, from 1982, Korean contractors steadily lost their ownership-specific advantage (low wages) which was particularly relevant to the Middle-East market, due to relatively high wage levels compared with those of Sri Lanka, Malaysia, Thailand, China and Turkey, in addition to a depressed oil prices. In matters of policy, Korean plant and construction firms which are highly dependent on the Middle-East market should consider diversifying their export markets from the Middle-East to the EEC, the USA, NICs and South-East Asia. Otherwise, they cannot expect to improve their export performance due to their ownership disadvantage in the Middle-East.

Among developed country firms the Middle-East is also inversely correlated with the USA (-0.515) but directly with NICs (0.545). Thus, firms with important export markets in the Middle-East regard the USA as a less important export region than NICs.

Comparing the variables significant in only one or other group, foreign market share in developed country firms is strongly inversely correlated with the USA (-0.787) and moderately directly correlated with

TABLE 8.15

THE CORRELATIONS AMONG FIRM OBJECTIVES, MARKET SHARE AND MAJOR EXPORT REGIONS (MER) OF 42 KOREAN PLANT AND CONSTRUCTION FIRMS

Correlated		Variables	Pearson Correlation Coefficient	Cases	P
Profit growth	by	Gross profit	0.463	41	0.001
		Market share	0.272	41	0.043
Return on investment	by	Market share growth	0.362	41	0.010
		Africa (MER)	0.875	5	0.026
		Market share	0.703	41	0.001
Sales growth	by	Market share growth	0.670	41	0.001
Market share	by	Market share growth	0.886	41	0.001
Labour productivity	by	USA (MER)	-0.482	34	0.002
		Middle-East (MER)	0.335	39	0.019
		Market share growth	0.297	40	0.031
Capacity utilisation	by	USA (MER)	-0.474	34	0.002
		Middle-East (MER)	0.327	40	0.020
Local market share	by	Foreign market share	-0.942	39	0.001
		Mediterranean countries	0.322	30	0.041
Middle-East (MER)	by	EEC (MER)	-0.538	32	0.001
		USA (MER)	-0.389	36	0.009
USA (MER)	by	EEC (MER)	0.531	32	0.001
NICs (MER)	by	South-East Asia (MER)	0.673	12	0.008
		Local market share	-0.868	6	0.013
Africa (MER)	by	Foreign market share	0.868	6	0.013
		Market share	0.802	5	0.051
		Market share growth	0.943	5	0.008

Source: TABLE 8.9.

TABLE 8.16

THE CORRELATIONS AMONG FIRM OBJECTIVES, MARKET SHARE AND MAJOR EXPORT REGIONS OF 17 PLANT AND CONSTRUCTION FIRMS IN THE DEVELOPED COUNTRIES

Correlated		Variables	Pearson Correlation Coefficient	Cases	P
		Local market share	0.539	16	0.016
		Foreign market share	-0.674	16	0.002
Profit growth	by	Return on investment	0.767	16	0.001
		Market share	0.449	16	0.041
		USA (MER)	0.535	13	0.030
		Sales growth	0.491	15	0.031
Return on investment	by	Market share growth	0.481	16	0.030
		Foreign market share	-0.567	16	0.011
		USA (MER)	0.645	13	0.009
Sales growth	by	Market share growth	0.585	15	0.011
		EEC (MER)	0.581	12	0.024
Market share	by	Market share growth	0.605	16	0.006
Market share growth	by	EEC (MER)	0.649	12	0.011
		Sales growth	0.612	15	0.008
		Market share	0.560	16	0.012
Capacity utilisation	by	Market share growth	0.448	16	0.041
		USA (MER)	0.502	13	0.040
		EEC (MER)	0.559	12	0.030
		Mediterranean countries	0.700	11	0.008
Local market share	by	Foreign market share	-0.843	16	0.001
		USA (MER)	0.525	13	0.033
Foreign market share	by	USA (MER)	-0.787	13	0.001
		Middle-East (MER)	0.454	16	0.039
Middle-East (MER)	by	NICs (MER)	0.545	14	0.022
		USA (MER)	-0.515	14	0.030

Source: TABLE 8.9.

the Middle-East (0.454). That is to say, firms of developed countries which sell their products more in foreign markets than in the domestic market consider the Middle-East to be very important and the USA less important. However, among Korean firms, there are no significant correlations between foreign market share and these two major export regions (USA and the Middle-East).

Table 8.17 and 8.18 show the correlations between firms' objectives and market share and firms' major export regions (MER) of 62 international firms from 12 countries and 45 firms from four NICs. Table 8.18 includes three more firms (from Turkey, Taiwan and Singapore) than Table 8.15.

8.1.3.2 BETWEEN PLANT AND CONSTRUCTION EXPORT FIRMS

As can be seen from Table 8.19 and 8.20, the significant variables which are common to both groups are as follows: gross profit, sales growth, market share, labour productivity and NICs (MER).

Of these, gross profit is more strongly correlated with profit growth (0.787) in plant export firms than in construction export firms (0.534). Thus, the more important the former consider gross profit the more important they consider profit growth compared with the latter. Sales growth is inversely correlated with foreign market share (-0.391) and South-East Asia (-0.538) among plant exporters, but inversely with local market share (-0.364) and directly with the Middle-East (0.355) among construction firms. Thus, plant exporters which consider sales growth to be a major objective sell their products less in foreign markets than in the local market. In contrast, construction export

TABLE 8.17

THE CORRELATIONS BETWEEN FIRM OBJECTIVES, MARKET SHARE AND MAJOR EXPORT REGIONS OF 62 INTERNATIONAL PLANT AND CONSTRUCTION FIRMS

Correlated		Variables	Pearson Correlation		
			Coefficient	Cases	P
Gross profit	by	Profit growth	0.395	60	0.001
		Africa (MER)	0.813	10	0.002
Profit growth	by	Return on investment	0.225	60	0.042
		Local market share	0.304	57	0.011
		Foreign market share	-0.372	58	0.002
		USA (MER)	0.291	49	0.021
Return on investment	by	Sales growth	0.229	58	0.042
		Market share	0.275	59	0.017
		Market share growth	0.324	59	0.006
		Capacity utilisation	0.228	59	0.041
		Labour productivity	0.365	58	0.022
Sales growth	by	Market share growth	0.621	59	0.001
		Africa (MER)	0.539	10	0.054
Market share	by	Market share growth	0.808	60	0.001
Labour productivity	by	Market share growth	0.235	58	0.038
Capacity utilisation	by	Mediterranean countries	0.285	42	0.034
		Middle-East (MER)	0.250	59	0.028
Middle-East (MER)	by	Mediterranean countries	0.233	49	0.053
		EEC (MER)	-0.351	46	0.008
		USA (MER)	0.250	59	0.028
USA (MER)	by	EEC (MER)	0.425	44	0.002
EEC (MER)	by	Mediterranean countries	0.282	40	0.039

Source: TABLE 8.9.

TABLE 8.18

THE CORRELATIONS BETWEEN FIRM OBJECTIVES, MARKET SHARE AND MAJOR EXPORT REGIONS (MER) OF 45 PLANT AND CONSTRUCTION FIRMS IN NICs

Correlated		Variables	Pearson Correlation Coefficient	Cases	P
Gross profit	by	Profit growth	0.508	44	0.001
		Africa (MER)	0.840	6	0.018
		Market share	0.305	44	0.022
Return on investment	by	Market share growth	0.412	44	0.003
		Labour productivity	0.266	42	0.044
		Market share	0.706	44	0.001
Sales growth	by	Market share growth	0.660	44	0.001
		Africa (MER)	0.612	6	0.098
Market share	by	Market share growth	0.881	44	0.001
		Market share growth	0.263	42	0.046
		Capacity utilisation	0.467	41	0.001
Labour productivity	by	USA (MER)	-0.499	35	0.001
		Middle-East (MER)	0.335	42	0.015
		Market share growth	0.299	43	0.026
Capacity utilisation	by	USA (MER)	-0.285	35	0.001
		Africa (MER)	0.612	6	0.098
		Middle-East (MER)	0.331	43	0.015
Local market share	by	Foreign market share	-0.943	42	0.001
		Mediterranean countries	0.339	32	0.029
Middle-East (MER)	by	EEC (MER)	-0.521	34	0.001
		USA (MER)	-0.402	37	0.007
USA (MER)	by	EEC (MER)	0.551	33	0.001

Source: TABLE 8.9.

TABLE 8.19

THE CORRELATIONS BETWEEN FIRM OBJECTIVES, MARKET SHARE AND MAJOR EXPORT REGIONS(MER) OF 19 PLANT EXPORT FIRMS IN FIVE COUNTRIES

Correlated		Variables	Pearson Correlation		
			Coefficient	Cases	P
Gross profit	by	Profit growth	0.787	19	0.001
Return on investment	by	Market share growth	0.432	19	0.032
		South-East Asia (MER)	0.566	8	0.072
Sales growth	by	Foreign market share	-0.391	18	0.054
		South-East Asia (MER)	-0.538	8	0.085
Market share	by	Local market share	0.424	17	0.045
		Foreign market share	-0.455	18	0.029
		Sales growth	0.676	19	0.001
Market share growth	by	Market share	0.648	19	0.001
		Local market share	0.451	17	0.035
		Foreign market share	-0.516	18	0.014
Labour productivity	by	Local market share	0.405	17	0.054
		Foreign market share	-0.385	18	0.057
Local market share	by	Foreign market share	-0.916	17	0.001
Middle-East (MER)	by	Mediterranean countries	0.512	17	0.018
		Local market share	0.405	16	0.060
NICs (MER)	by	Foreign market share	-0.370	17	0.072
		Middle-East (MER)	0.572	18	0.007
		Mediterranean countries	0.425	16	0.050
USA (MER)	by	EEC (MER)	0.491	19	0.016

Source: Table 8.9.

TABLE 8.20

THE CORRELATIONS BETWEEN FIRM OBJECTIVES, MARKET SHARE AND MAJOR EXPORT REGIONS(MER) OF 24 CONSTRUCTION EXPORT FIRMS IN 12 COUNTRIES

Correlated		Variables	Pearson Correlation		
			Coefficient	Cases	P
		Profit growth	0.534	23	0.004
Gross profit	by	Africa (MER)	0.842	7	0.009
		South-East Asia (MER)	0.500	10	0.071
Profit growth	by	EEC (MER)	-0.494	13	0.043
		NICs (MER)	0.403	14	0.077
Return on investment	by	Mediterranean countries	0.590	13	0.017
		NICs (MER)	0.505	14	0.033
		Market share	0.805	23	0.001
Sales growth	by	Market share growth	0.731	23	0.001
		Local market share	-0.364	23	0.044
		Middle-East (MER)	0.355	23	0.048
Market share	by	Local market share	-0.340	23	0.056
		Market share growth	0.890	23	0.001
Market share growth	by	Mediterranean countries	0.483	13	0.047
		Labour productivity	0.544	21	0.005
Capacity utilisation	by	Local market share	-0.342	23	0.055
		Mediterranean countries	0.569	13	0.021
Labour productivity	by	Local market share	-0.706	21	0.001
Middle-East (MER)	by	Foreign market share	0.331	24	0.057
		Local market share	-0.315	24	0.067
NICs (MER)	by	Foreign market share	-0.436	15	0.052
		Africa (MER)	0.777	6	0.035
		Foreign market share	-0.657	17	0.002
USA (MER)	by	Middle-East (MER)	-0.478	17	0.026
		Africa (MER)	-0.843	5	0.037

firms with consider sales growth to be a major objective sell their products more in foreign markets than in the local market. Similarly, market share is directly correlated with local market share (0.424) in plant exporters but inversely (-0.340) in construction firms, indicating that market share oriented plant exporters seek market share in the local market and construction export firms in foreign markets.

Labour productivity is moderately correlated with local market share (0.405) in plant exporters but strongly inversely correlated (-0.706) in construction firms, implying that the plant exporters which regard labour productivity as a very important objective sell their products more in the local market than in foreign markets and construction firms more in foreign markets.

The NICs(MER) variable is moderately inversely correlated with foreign market share in both groups. Thus, both plant and construction export firms for whom NICs are a very important export region sell their products more in the local market than in foreign markets. Plant exporters which consider NICs to be very important markets regard the Middle-East and Mediterranean countries as their important export regions, in contrast with construction firms which regard Africa as an important export region.

8.2 FACTORS IN THE SUCCESS AND FAILURE OF TENDERS FOR PLANT AND CONSTRUCTION EXPORTS

Section 2 employs factor and discriminant analysis to interpret the findings of this survey regarding the determinants of successful/failed tenders for plant and construction exports.

8.2.1 SUCCESS FACTORS

The important factors which explain bid success among our sample of 42 Korean firms and 20 firms in 11 other countries are to be examined, followed by group comparisons between Korean and foreign firms and between plant and construction export firms of attitudinal differences to the key elements of successful tendering for plant and construction exports. The section concludes with a ranking by the Korean and foreign firms of the relative importance of success factors.

8.2.1.1 AN ANALYSIS OF SUCCESS FACTORS

Factor analysis techniques examine the correlation structure of a set of observed variables (manifestation variables) to determine if the observed correlations can be reproduced from a smaller set of hypothetical underlying variables (factors). In other words, the objective of factor analysis is to examine the interdependence or structure of these variables. There are two methods of factor analysis, namely, principal component and classical factor analysis. In principal component analysis any part of the variance in each variable is simply ignored. With classical factor analysis a statistical model is assumed which explicitly provides for an error term, referred to as the specific variance, for any unaccounted part of the variance in each variable. The total variance for each variable is consequently assumed to be made up of two parts: communality (shared or common variance), which is explained by the retained factors, and specific variance, which is not so explained. Classical factor analysis is used in this chapter.

Rotation is employed to maximise the variance explained by each successive component. When the coordinates change, the set of correlations between the manifestation variables and the rotated factors (the loadings which form the factor structure) also change. The motivation for performing the rotation is that the new loadings might make each factor easier to understand.

Table 8.21 shows the communalities and eigenvalues after rotation and iterations involving 18 manifestation variables (described in Table 8.27 and appendix 1). The communality is equivalent to the R value that would be obtained if we were to use the manifestation variables as a criterion variable and all of the retained factors as predictor variables in multiple regression analysis. According to Table 8.21, three factors with an eigenvalue > 1 explain 80.9% of the total variance after rotation, of which factor 1 explains almost 55.0%.

The communality for a specific variable is equal to the sum of its squared correlations with each retained component. As can be seen from Table 8.21, V48 (close political and diplomatic relations) is best explained by the retained factors, followed by V39 (price competitiveness) and V51 (mutual co-operation with consulting firms). In contrast, V42 (reputation and past record) is least explained, followed by V40 (attractive bid package).

Interpretation is usually accomplished by calculating the set of sample correlations between each factor and all of the observed variables (i.e. the <u>factor loadings</u>). The variable which correlates most strongly with a factor is the most important in providing its definition.

In Table 8.22 the <u>factor loadings</u> which are the largest in magnitude are circled in each column. The pattern suggests that successful tendering can best be explained by the following five factors:

Factor	Description
1	Co-operation with importing countries
2	Quality of bidder
3	Contact with importing countries
4	Incidental conditions imposed by importing countries
5	Price competitiveness

TABLE 8.21

THE COMMUNALITIES AND EIGENVALUES AFTER ROTATION AND ITERATION

VARIABLE	COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
V38	.49277	1	5.14883	54.2	54.2
V39	.71990	2	1.43924	15.2	69.4
V40	.35180	3	1.09608	11.5	80.9
V41	.55222	4	.95929	10.1	91.0
V42	.30270	5	.85322	9.0	100.0
V43	.36993				
V44	.35978				
V45	.62148				
V46	.52631				
V47	.41459				
V48	.76429				
V49	.61153				
V50	.46672				
V51	.71518				
V52	.67246				
V53	.52670				
V54	.44472				
V55	.58358				

Source: The output of SPSS (Factor Analysis Program) for question No.6.

TABLE 8.22

VARIMAX ROTATED FACTOR MATRIX AFTER ROTATION WITH KAISER NORMALISATION

VARIABLE	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
V38	.22563	.46409	-.23500	.41380	.00547
V39	.07244	-.11659	.09515	-.01465	.83174
V40	.13081	.09597	.02852	.56978	.00340
V41	.28535	.57277	.19100	.04141	.32330
V42	-.05632	.40145	-.04615	.13830	.34220
V43	.19450	.56369	.03018	-.03133	-.11163
V44	.14817	.54463	.17907	.03054	-.09059
V45	-.09737	.60481	.33886	.35552	-.07057
V46	.35917	.03223	.31317	.54599	.00928
V47	.08137	.10765	.34971	.43561	.29039
V48	.33128	.11490	.78421	.11874	.11070
V49	.27238	.20705	.69818	.08299	-.01152
V50	.54685	.09373	.24286	.31305	.04364
V51	.78151	.26478	.16745	-.07677	-.01938
V52	.71365	.26661	.02458	.23130	.19488
V53	.62548	.12197	.26559	.22370	-.00443
V54	.10793	.44732	.43261	.11312	.18172
V55	.53047	-.15715	.36942	.37333	-.04036

Source: The output of SPSS (Factor Analysis Program) for question No.6.

Amongst these five factors, factor 1 (cooperation with importing countries) explains 54.2% of the total variance, factor 2 (quality of bidder) 15.2%, factor 3 (contact with importing countries) 11.5%, factor 4 10%, and factor 5 explains 9.0% (see Table 8.21).

The strong explanatory power of these indicators of successful tendering allows one to prescribe the following policy/strategic recommendations in pursuit of a more competitive performance by plant and construction exporters.

1. A greater emphasis on joint-ventures, mutually co-operative arrangements (with consultants being given responsibility for feasibility studies and negotiations with foreign government officials) and consortia membership.
2. Greater attention to meeting delivery dates, after-sales service and product quality, the benefits from which are likely to materialise in time with more experience in international markets of the tender process.
3. A positive response to the perception that a higher level of success is likely to be achieved in markets where Korea has close political and cultural ties.
4. A greater awareness that a common expectation by importing nations is for favourable and competitive credit terms and for a commitment to high local procurement ratios.
5. Continuing price competitiveness. There are already signs that Korean firms are facing increasing price competitiveness from South-East Asia. In Korea productivity improvements are increasingly likely to displace low wage costs as the means to maintaining this advantage.

8.2.1.2 GROUP COMPARISONS

There are two groups in the country comparisons, namely Korea and the eleven countries already identified. An industry comparison is also made between plant exporters and construction firms. Thus, in total, four groups are compared by means of discriminant analysis to determine attitudinal differences.

COUNTRY COMPARISONS

A stepwise discriminant analysis was considered a) to determine whether statistical differences exist between Korea and other countries, b) to identify the independent variables which explain most of the differences between groups and c) to predict group memberships of firms on the basis of their scores from several variables.

TABLE 8.23

DISCRIMINATED SUMMARY TABLE

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V51		1	.895658	.0115	Mutual cooperation with a consulting firm
2	V48		2	.739665	.0003	Close political relations
3	V53		3	.659263	.0001	Negotiating ability
4	V55		4	.582136	.0000	Financial arrangements
5	V50		5	.545506	.0000	Mutual economic cooperation
6	V54		6	.522042	.0000	Quality guarantee
7	V41		7	.508189	.0000	Delivery date
8	V47		8	.487511	.0000	High ratio of local procurement
9	V52		9	.459350	.0000	Member of international consortium
10		V48	8	.463176	.0000	Close political relations
11	V40		9	.448810	.0000	Attractive bid package

Source: The output of SPSS (Discriminant Analysis) for question No.6

Table 8.23 shows the discriminating variables which significantly contribute to discriminate between the two country groups from among 18 potential factors to explain the success of tenders for plant and construction exports (from a usable sample of 41 Korean and 16 foreign firms). As shown in the table, nine variables effectively discriminate between the two groups. The inclusion of additional variables does not significantly contribute to further discrimination.

The most significantly discriminated variable is V51 (mutual cooperation with the consulting firm responsible for the feasibility study), followed by V48 (close political and diplomatic relation between countries). The least significanty discriminated variables are V40 (attractive bid package: technology, installation, construction and funds), and V52 (membership of an international consortium). The group means' of these four variables are as follows:

	Korea	11 others		Korea	11 others
V51	4.122	3.125	V40	5.341	5.187
V48	2.976	3.625	V52	3.085	3.000

The validity of the discriminant functions are assessed by four standard criteria: eigenvalues, as measures of total variance in the discriminating variables; canonical correlation coefficients, as indicators (discriminating power) of the association between the discriminating functions and the variables which define group membership; Wilks' lambda, as an inverse measure of the discriminating power of those variables which have not been removed by the discriminating function; and chi-squared, which can be derived from Wilks' lambda to provide an indication of statistical significance.

We can test the null hypothesis that there is no difference between the group centroids defined in terms of the nine variables (see Table 8.23).

$$Ho: \mu 1=\mu 2$$

$$H1: \mu 1\neq\mu 2$$

where $\mu1$ is the population centroid for group 1, and $\mu2$ is the corresponding centroid for group 2. The critical (rejection) region for this test is:

Reject Ho if $Xo > X\alpha,\ p(g-1)$

where $X\alpha,\ p(g-1)$ is the value of a chi-square variable with p(g-1) degrees of freedom which is exceeded with probability α.

According to the output of SPSS Canonical Discriminant Functions (Discriminant Analysis Program) for question No.6, Xo is 40.458 and $X_{0.005,9}$ is 23.6[2]. Therefore, Ho is rejected ($Xo > X_{0.005,9}$) and we can conclude that there is a significant difference in the respective country group centroids (between Korea and 11 other countries) at 0.005 significance level. In addition to the chi-squared test, the output of SPSS also shows that the eigenvalue, canonical correlation, Wilks lambda and significance are 1.228, 0.742, 0.449, and 0.0000, respectively. These figures indicate a strong discriminating power and significance level.

As a method of evaluating the effectiveness of the classification functions, they can be used to make assignment decisions for observations with known group membership. The classification results are shown in Table 8.24.

The results in Table 8.24 indicate that 37 of 41 observations actually in group 1 were correctly assigned to group 1 by the classification function, and 14 of 18 observations in group 2 were correctly assigned to group 2. From a total of 59 observations (the sum of all four entries), 51 (86.44%) were correctly classified. The high ratio of correctly classified cases is an indicator that this classification function is highly effective.

TABLE 8.24

CLASSIFICATION RESULTS

Actual Group		No of Cases	Predicted Group Group1	Group2
Group Korea	1	41	37 90.2	4 9.8
Group 11 Others	2	18	4 22.2	14 77.8

Percent correctly classified: 86.44%

Source: The output of SPSS (Discriminant Analysis Program) for question No.6.

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Table 8.25 shows the discriminating variables which significantly discriminate between the two industry groups, namely 18 plant exporters and 21 construction firms, from among 18 potential factors in the success of tenders for plant and construction exports. As can be seen, only four variables significantly discriminate between the two groups.

TABLE 8.25

DISCRIMINATED SUMMARY TABLE

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V46		1	.908773	.0617	Competitive payment conditions
2	V44		2	.858947	.0648	Experience of tender process
3	V51		3	.821556	.0727	Mutual cooperation with a consulting firm
4	V47		4	.774998	.0633	High ratio of local procurement

Source: The output of SPSS (Discriminant Analysis) for question No.6.

The group means[1] of these four variables are as follows:

	Plant	Construction		Plant	Construction
V46	3.889	4.762	V51	3.833	3.762
V44	3.556	4.238	V47	3.222	3.381

Again, we can test the null hypothesis that there is no difference between group centroids defined in terms of the above four variables.

$$Ho: \mu1=\mu2$$

$$H1: \mu1\neq\mu2$$

where $\mu1$ is the population centroid for group 1, and $\mu2$ is the corresponding centroid for group 2. The critical (rejection) region for this test is:

$$\text{Reject Ho if } Xo > X\alpha,\ p(g-1)$$

where $X\alpha$, $p(g-1)$ is the value of a chi-square variable with $p(g-1)$ degrees of freedom which is exceeded with probability α.

Since Xo is 8.9213 and $X_{0.1,4}$ is 7.78[2], Ho is rejected ($Xo > X_{0.1,4}$) and we can conclude that there is a significant difference in group centroids (plant and construction) at 0.1 significance level. The eigenvalue, canonical correlation, Wilks lambda and significance are 0.290, 0.474, 0.775 and 0.063, respectively.

Because the eigenvalue and canonical correlation are not large and the selected four discriminant variables have a weak discriminant power, the discriminant function is less valid than the country group model.

Table 8.26 indicates the effectiveness of the classification functions for the industry groups. It can be seen that 14 of 18 observations actually in group 1 were correctly assigned to group 1 by the classification function, and 15 of 23 observations in group 2 were correctly assigned to group 2. From a total of 41 observations, 29 (70.33%) were correctly classified in this moderately effective function.

TABLE 8.26

CLASSIFICATION RESULTS

Actual Group		No of Cases	Predicted Group1	Group Group2
Group	1	18	14	4
Plant			77.8	22.2
Group	2	23	8	15
Construction			34.8	65.2
Percent correctly classified: 70.73%				

Source: The output of SPSS (Discriminant Analysis) for question No.6.

8.2.1.3 THE IMPORTANT FACTORS RANKED BY KOREAN AND FOREIGN FIRMS

As shown in Table 8.27, both Korean plant and construction companies and those of 11 other countries view price competitiveness and an attractive bid package (e.g. technology, installation, construction and funds) as the most important success factors in tenders for plant and construction exports. These factors are the top ranked in both groups with a mean score > 5.188. However, in addition, Korean plant and construction companies also regard technological attributes as important factors. This may be attributable to a low technological level in Korean firms compared with that of competitors.

The table also shows that both country groups consider traditional cultural links to be relatively less important (with mean scores of 2.34

TABLE 8.27

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO SUCCESS FACTORS IN TENDERS FOR PLANT AND CONSTRUCTION EXPORTS

Variable Number	Factors	Weighted Mean Score: Korea (a)	Weighted Mean Score: 11 Other Countries (b)
V38	Technological Attributes	5.195(3)	4.875(3)
V39	Price competitiveness	5.561(1)	5.688(1)
*V40	Attractive bid package	5.342(2)	5.188(2)
*V41	Delivery date	4.537(6)	4.063(10)
V42	Reputation and past record	4.439(8)	4.688(5)
V43	Competent knowledge	4.879(4)	4.750(4)
V44	Experience of tender process	3.878(11)	3.625(12)
V45	After-sales service	3.537(14)	3.563(15)
V46	Competitive payment conditions	4.512(7)	4.437(7)
*V47	High ratio of local procurement	3.146(16)	4.188(8)
V48	Close political and diplomatic relation	2.976(17)	3.625(12)
V49	Traditional cultural link	2.341(18)	2.625(18)
*V50	Mutual economic co-operation	3.366(15)	3.750(11)
*V51	Mutual co-operation with consulting firm	4.122(9)	3.125(16)
*V52	Member of international consortium	3.805(12)	3.000(17)
*V53	Negotiating ability with foreign government	4.683(5)	3.625(12)
*V54	Quality guarantee of products exported	3.756(13)	4.188(8)
*V55	Financial arrangements	4.098(10)	4.625(6)

Source: Calculated from the output of SPSS (Discriminant Analysis Program) for question No.6. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: from 7 (extremely important) to 1 (extremely unimportant).

Note: 1. * represents significantly discriminated variables.

2. (a) 42 companies (b) 16 companies, 11 countries

3. Figures in brackets indicate ranking according to importance.

and 2.625, respectively). In addition, Korea regards V48 (close political and diplomatic relations) as a less important success factor (with a mean score of 2.976) and other countries so regard V52 (membership of an international consortium), with a mean score of 3.000.

The major differences between the two groups were explained in the group comparisons, which were analysed by discriminant analysis in section 8.2.1.2. above.

8.2.2 FAILURE FACTORS

The important factors which explain bid failures are to be examined in this sub-section, together with country and industry group comparisons, to identify attitudinal differences towards the reasons for failed tenders for plant and construction exports. The relative importance of these factors is determined from a ranking by 41 Korean and 15 foreign firms.

8.2.2.1 AN ANALYSIS OF FAILURE

Classical factor analysis method is again used to analyse the failure factors, and rotation is performed to maximise the variance explained by each successive component.

Table 8.28 shows the communalities and eigenvalues after rotation and iterations with respect to 19 manifestation variables (described in Table 8.34 and appendix 1). According to Table 8.28, three factors, with an eigenvalue > 1, explain 93.0% of the total variance after rotation. These three factors capture most of information measured by all of the variables (V56 to V74). In particular, factor 1 captures more than 70.0% of the information.

TABLE 8.28

THE COMMUNALITIES AND EIGENVALUES AFTER ROTATION AND ITERATIONS

VARIABLE	COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
V56	.52700	1	7.78678	70.6	70.6
V57	.73370	2	1.39583	12.7	83.2
V58	.64115	3	1.07599	9.8	93.0
V59	.42853	4	.77534	7.0	100.0
V60	.44700				
V61	.68376				
V62	.70199				
V63	.52811				
V64	.32490				
V65	.10064				
V66	.53192				
V67	.79768				
V68	.70989				
V69	.56682				
V70	.76237				
V71	.58516				
V72	.57664				
V73	.83069				
V74	.53599				

Source: The output of SPSS (Factor Analysis Program) for question No.7.

With regard to communality, as can be seen, 83.1% of V73 (lack of guarantee of products exported) is explained by the retained factors, followed by V67 (weak political and diplomatic relationships between countries) and V70 (inadequate co-operation with consulting firms). In contrast, only 10.1% of V65 (excessive competition among native firms) is explained by the retained factors, followed by V64 (unsatisfactory payment conditions).

Comparing these results with the success factors which were represented in the previous sub-section, political and diplomatic relation between countries (V48 and V67) and "mutual co-operation with consulting firms taking charge of the feasibility study" (V51 and V70) are strongly explained (>70%) by the retained factors in both cases.

TABLE 8.29

VARIMAX ROTATED FACTOR MATRIX AFTER ROTATION WITH KAISER NORMALISATION

VARIABLE	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4
V56	-.02424	.04176	-.08669	.71913
V57	-.04148	.79039	.32459	-.04360
V58	.17917	.75411	.19705	-.03912
V59	.26724	.51711	.07330	.29042
V60	.19328	.42391	.32437	.35316
V61	.32746	.45132	.51155	.33339
V62	.46920	.48726	.48524	.09459
V63	.45170	.53599	.16174	.10312
V64	.49536	.26043	.09711	.06358
V65	.25933	-.09263	.06850	.14184
V66	.67403	.11295	.25395	-.01875
V67	.78513	.09016	.39877	-.11879
V68	.77658	.28623	.15671	.01833
V69	.64740	.32051	.20078	-.06827
V70	.17013	.16118	.84092	-.01732
V71	.31768	.23391	.64059	-.13845
V72	.36893	.42395	.50674	.06337
V73	.63706	.66266	.06823	-.03285
V74	.67031	.20136	.12293	.17614

Source: The output of SPSS (Factor Analysis Program) for question No. 7.

In Table 8.29, the factor loadings which are the largest in magnitude are circled in each column of the questions represented by the variables (definitions of which are shown in Table 8.34). The following interpretation of the four rotated factors is suggested:

Factor	Definition
1	Inadequate co-operation
2	Low quality of bidder
3	Weak commercial ties
4	Price disadvantage

The reason for failed tenders for plant and construction exports can best be explained by these four factors, of which factor 1 (inadequate co-operation) explains 70.6% of the total variance (see Table 8.28).

Recommendations which might follow from this include:

1. Plant and construction export firms should take steps to improve co-operation with importing countries through government and commercial channels. Close attention should be given to the provision of acceptable credit terms, the avoidance of excessive competition among Korean firms for the same international contract, and higher procurement ratios in the importing countries. In addition, at the governmental level, better political and diplomatic relations should be nartured and traditional cultural links with importing countries should be exploited; and at the commercial level, trading links, joint-ventures and technical agreements should be pursued more vigourously.
2. Firms should commit themselves to improving their technological competence, meeting delivery dates and achieve a more balanced tender with respect to technological content and after-sales service.

3. Firms are required to improve their knowledge of international markets and to pay close attention to the importance of consortia bids and foster closer inter-action with consultant firms.
4. Despite the price competitiveness of Korean firms in international markets, the importance given to this is perhaps indicative of the price competition which has come in recent years from emerging NICs. Firms need to be aware that this traditional strength cannot be sustained without constant attention to minimising unit costs of production.

8.2.2.2 GROUP COMPARISONS

There are four group comparisons, namely, two country comparisons (Korea and eleven other countries) and two industry comparisons (plant and construction). As before, discriminant analysis is employed to ascertain attitudinal differences between the groups.

COUNTRY COMPARISONS

Table 8.30 shows the variables which significantly discriminate between the two country groups according to the responses of 41 Korean and 15 other international firms.

As shown in the table, beginning with V67 (the best discriminating variable), eleven variables discriminate effectively between the two groups and the inclusion of additional variable does not significantly contribute to further discriminatory power of the function.

The most significantly discriminating variables are V67 (weak political and diplomatic relationships), V57 (low technology) and V59 (date of delivery). The least significanty discriminating variables are V71 (non-member of international consortium), V58(weak bid package: technology, installation, construction and funds) and V66 (low ratio of local procurement: manpower, installation, machinery and tools). The group means' of these six variables are as follows:

	Korea	11 others		Korea	11 others
V67	2.293	3.733	V71	3.098	3.000
V57	4.854	3.867	V58	4.805	4.200
V59	3.122	3.600	V66	2.585	3.667

TABLE 8.30

DISCRIMINATED SUMMARY TABLE

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V67		1	.835088	.0019	Weak political and diplomatic relationships
2	V57		2	.678947	.0000	Low technology
3	V59		3	.641483	.0000	Date of delivery
4	V72		4	.610027	.0000	Lack of negotiating ability
5	V60		5	.583756	.0000	Poor reputation and past record
6	V62		6	.568613	.0001	Lack of bid experience
7	V65		7	.554037	.0001	Excessive competition among native firms
8	V63		8	.531428	.0001	Poor after sales services
9	V66		9	.518568	.0002	Low ratio of local procurement
10	V58		10	.502979	.0002	Weak bid package
11	V71		11	.484224	.0003	Non-member of international consortium

Source: The output of SPSS (Discriminant Analysis) for question No. 7.

According to the output of SPSS (Discriminant Analysis Program) for question No.7, X_o is 35.173 and $X_{o.005,11}$ is 26.8[2]. Therefore, Ho is rejected ($X_o > X_{o.005,11}$), and we can conclude that there is a significant difference in group centroids (between Korea and 11 other countries) at 0.005 significance level. In addition to chi-squared, the eigenvalue, canonical correlation, Wilks lambda and significance are 1.065, 0.718, 0.484 and 0.0002, respectively, figures which indicate a strong discriminating power and significance level. The canonical discriminant function has particularly strong validity.

The classification functions which are used as a method of evaluating the effectiveness of those functions are shown in Table 8.31.

TABLE 8.31

CLASSIFICATION RESULTS: COUNTRY GROUPS

Actual	Group	No of Cases	Predicted Group1	Group Group2
Group	1	41	36	5
Korea			87.8	12.2
Group	2	16	0	16
11 Others			0.0	100.0

Percent of grouped cases correctly classified: 91.23%

Source: The output of Classification Results (Discriminant Analysis Program) for question No.7.

The results in Table 8.31 indicate that the classification function is most effective. 36 of 41 observations actually in group 1 were correctly assigned to group 1 by the classification function, and 16 of 16 observations in group 2 were correctly assigned to group 2. Thus, from a total of 57 observations (the sum of all four entries), 52 (91.23%) were correctly classified.

PLANT AND CONSTRUCTION EXPORT FIRMS

As can be seen in Table 8.32, beginning with V74, six variables, from 19, effectively discriminate between the two industry groups (represented by 18 plant and 21 construction firms).

TABLE 8.32

DISCRIMINATED SUMMARY TABLE: INDUSTRY GROUPS

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V74		1	.852033	.0156	Inability to offer funding arrangements
2	V60		2	.765980	.0082	Poor reputation and past record
3	V67		3	.720777	.0088	Weak political and diplomatic relationships
4	V63		4	.681760	.0095	Poor after-sales service
5	V61		5	.640022	.0089	Inadequate knowledge regarding overseas plant markets
6	V56		6	.620410	.0128	Price disadvantage

Source: The output of SPSS (Discriminant Analysis) for question No. 7.

The most significantly discriminating variables are V74, V60 and V67. The least significantly discriminating variables are V56 and V61. The group means of these six variables are as follows:

	Plant	Construction		Plant	Construction
V74	2.889	4.333	V63	2.611	2.429
V60	3.500	3.143	V61	2.778	3.714
V67	1.833	3.143	V56	5.556	5.667

Calculation was based on multiplying the frequency count of each scale (a seven-point bi-polar rating scale) by weights given to these values: from 7 (extremely important) to 1 (extremely unimportant).

Since Xo is 16.231 and $X_{o.025,6}$ is 14.4^2, Ho is rejected (Xo > $X_{o.025,6}$) and we can conclude that there is a significant difference in group centroids (between plant and construction) at 0.025 significance level. The eigenvalue, canonical correlation, Wilks lambda and significance are 0.612, 0.616, 0.620 and 0.013, respectively.

It can be inferred from these results that the discrimination function has a moderate validity and discriminating power because the eigenvalue and canonical correlation are only moderately supportive.

Comparing the previous country analysis with the industry analysis, the six discriminating variables of the latter (plant and construction) have less validity and a weaker discriminant power than the eleven discriminant variables of the former.

Table 8.33 shows the classification result for the industry analysis, which indicates the effectiveness of the classification functions.

The results in Table 8.33 indicate that 13 of 18 observations actually in group 1 were correctly assigned to group 1 by the classification function, and 19 of 22 observations in group 2 were correctly assigned to group 2. From a total of 40 observations, 32 (80.0%) were correctly classified. Thus, the classification function is moderately effective.

TABLE 8.33

CLASSIFICATION RESULTS

Actual	Group	No of Cases	Predicted Group1	Group Group2
Group	1	18	13	5
Plant			72.2	27.8
Group	2	22	3	19
Construction			13.6	86.4

Percent of grouped cases correctly classified: 80.0%

Source: The output of Classification Results (Discriminant Analysis Program) for question No.7.

8.2.2.3 THE IMPORTANT FACTORS RANKED BY KOREAN AND FOREIGN FIRMS

As shown in Table 8.34, both Korean plant and construction companies and those of 11 other countries regard price disadvantage as a greatly important factor in the failure of tenders for plant and construction exports. Both groups also regard poor after-sales service and lack of traditional cultural link as relatively less important factors.

Comparing the important factors in failure with those in success, price is considered to be greatly important in both country groups (Korea and 11 other countries). In contrast, traditional cultural links are regarded as less important in tenders for plant and construction exports.

Tables 8.34 shows that the failure factors with the greatest mean difference between Korea and 11 other countries are low technology, low ratio of local procurement, weak political and diplomatic relationships and lack of traditional cultural links.

TABLE 8.34

A COMPARISON BETWEEN KOREA AND 11 OTHERS WITH REGARD TO FAILURE FACTORS OF TENDERS FOR PLANT AND CONSTRUCTION EXPORTS

Variable Number	Factors	Weighted Mean Score	
		Korea (a)	11 Other Countries(b)
*V56	Price disadvantage	5.610(1)	5.733(1)
V57	Low technology	4.854(2)	3.867(7)
V58	Weak bid package	4.805(3)	4.200(4)
V59	Date of delivery	3.122(11)	3.600(12)
*V60	Poor reputation and past record	3.561(7)	4.000(5)
*V61	Inadequate knowledge of plant markets	3.463(10)	3.933(6)
V62	Lack of bid experience	3.024(13)	3.533(13)
*V63	Poor after-sales service	2.463(16)	2.867(18)
V64	Unsatisfactory payment condition	3.756(6)	4.333(2)
V65	Excessive competition among native firms	3.902(4)	3.867(7)
V66	Low ratio of local procurement	2.585(15)	3.667(10)
*V67	Weak political and diplomatic relation	2.293(18)	3.733(9)
V68	Lack of traditional cultural link	1.659(19)	2.867(18)
V69	Lack of mutual economic co-operation	2.829(14)	3.533(13)
V70	Inadequate co-operation with consulting firms	3.512(8)	3.533(13)
V71	Non-member of international consortium	3.098(12)	3.533(13)
V72	Lack of negotiating ability	3.854(5)	3.667(10)
V73	Lack of guarantee of products exported	2.439(17)	3.133(16)
*V74	Inability to offer funding arrangements	3.488(9)	4.267(3)

Source: TABLE 8.27. The above figures was based on multiplying the frequency count of each value by weights given to these values: from 7 (extremely important) to 1 (extremely unimportant).

Note: 1. * represents significantly discriminatory variables.
2. (a) 41 companies (b) 15 companies, 11 countries
3. Figures in brackets indicate ranking according to importance.

8.3 FACTORS IN THE SUCCESS AND FAILURE OF TENDERS FOR KOREAN CONSTRUCTION EXPORTS

Section 3 again employs factor and discriminant analysis, this time to interpret the findings of our survey with regard to the determinants of successful/failed tenders for Korean construction exports.

8.3.1 SUCCESS FACTORS

This section examines the explanation for successful tenders for Korean construction exports as revealed by the survey of 42 Korean firms and 20 international firms from other countries. Group comparisons are again made to determine attitudinal differences in factors which are regarded as having an influential bearing on successful tenders, followed by a ranking of success factors by the sample of Korean and foreign construction firms.

8.3.1.1 AN ANALYSIS OF SUCCESS FACTORS

Classical factor analysis and rotation, as explained in the previous section, are again employed so as to include any unaccounted part of the variance in each variable and to maximise the variance explained by each successive component.

Table 8.35 shows the communalities (shared or common variances) which are explained by the retained factors and eigenvalues after rotation and iterations of four manifestation variables (as described in Table 8.41 and appendix 1). According to Table 8.35, two factors, with an eigenvalue < 1, explain all of the total variance after rotation, of which factor 1 explains almost 71.0%.

TABLE 8.35

THE COMMUNALITIES AND EIGENVALUES AFTER ROTATION AND ITERATION

VARIABLE	COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
V94	.29915	1	.85820	70.6	70.6
V95	.38668	2	.35661	29.4	100.0
V96	.51302				
V97	.01595				

Source: The output of SPSS (Factor Analysis Program) for question No.11

With respect to communality, as can be seen, 51.3 % of variable V96 (an aptitude for new ventures) is explained by the retained factors, followed by V95 (a supportive and sympathetic government policy) and V94 (low wages). The variable V97 (increased oil prices during the 1970s) is least explained by the retained factors.

In Table 8.36 the pattern suggested by the <u>factor loadings</u> is that successful tendering for construction exports is explained best by the following two factors:

<u>Factor</u>	<u>Description</u>
1	Quality of bidder and increased oil prices
2	Low wages

Amongst these two factors, factor 1 (quality of bidder and increased oil prices) explains 70.6% of the total variance and factor2 (low wages) explains 29.4%.

TABLE 8.36

VARIMAX ROTATED FACTOR MATRIX AFTER ROTATION WITH KAISER NORMALISATION

VARIABLE	FACTOR 1	FACTOR 2
V94	-.04427	.54515
V95	.61436	.09613
V96	.59556	-.39791
V97	.11113	-.05999

Source: The output of SPSS (Factor Analysis Program) for question No. 11.

The strong explanatory power of these indicators of successful tendering suggests the following policy prescriptions for a more successful performance by Korean construction firms in international markets.

1. A higher level of success is likely to be achieved through a more supportive and sympathetic government policy, for example one which would allow competitive export credits, subsidies from public funds to finance development and feasibility studies, and competitive deferred payment terms to developing country customers.
2. Encouragement of new ventures directed towards exporting, perhaps by a government policy which discriminates in favour of exporters.
3. Low wages in Korea is the major element in explaining her price competitiveness. As with plant exports, wage pressures in the labour market (as a function of high growth rates of output) indicate that continued price competitiveness can only come from productivity improvements.
4. In the case of Korean construction export firms, their export pattern has been heavily influenced by oil price increases in the 1970s, which encouraged firms to pursue opportunities in the Middle-

East in that period. The subsequent decrease in oil prices in recent years has severely restricted the level of activity in this region, which formerly accounted for about 70.0 % of Korea's total construction export volume. Korean construction firms should be encouraged to diversify their export markets from the Middle-East to South-East Asia and the USA. This trend is already apparent. According to the Minister of Construction in Korea, the ratio of exports to the Middle-East had been reduced to 55.0 % in the first half of 1987 and had increasd to South-East Asia and USA from 6.5 % to around 40.0 % (The Seoul Shinmun, 8th July 1987, pp. 5).

8.3.1.2 GROUP COMPARISONS

As before, the group comparisons to determine attitudinal differences, using discriminant analysis, involve the country groups (Korea vs. other international exporting countries) and two industry groups (plant exporters vs. construction exporters).

COUNTRY COMPARISONS

Table 8.37, from a usable sample of 39 Korean firms and 19 foreign firms, shows the discriminating variables which significantly discriminate between the two country groups from among four factors in the success of tenders for construction exports.

As shown in Table 8.37, two variables effectively discriminate between the two groups and the inclusion of additional variables does not significantly improve the discriminatory power of the function.

TABLE 8.37

DISCRIMINATED SUMMARY TABLE

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V97		1	.893468	.0124	Increased oil prices during 1970s
2	V95		2	.844616	.0096	Supportive and sympathetic government policy

Source: The output of SPSS (Discriminant Analysis) for question No.11

The significantly discriminated variables are V97 (increased oil prices during the 1970s) and V95 (supportive and sympathetic government policy). The group means' of these two variables are as follows:

	Korea	11 others		Korea	11 others
V97	4.872	3.789	V95	4.308	4.895

According to the above results, Korean firms consider V97 to have been a critical factor, giving support to the notion that Korean firms have probably been more vulnerable to fluctuations in oil price in the Middle-East than their competitors. These results also show that Korean firms consider V95 (supportive and sympathetic government policy) to be relatively less important than V97 (increased oil prices during the 1970s), whereas foreign firms regard V95 as more important reason for the success of Korean tenders for construction exports.

According to the output of SPSS Canonical Discriminant Functions (Discriminant Analysis Program) for question No.11, Xo is 9.288 and $X_{o.01,2}$ is 9.21[2]. Therefore, the null hypothesis is rejected (Xo > $X_{o.01,2}$), and we can conclude that there is a significant difference in group centroids (between Korea and 11 other countries) at 0.01 significance level. In addition to the chi-squared test, the output of SPSS also shows that the eigenvalue, canonical correlation, Wilks lambda and significance are 0.184, 0.394, 0.845, and 0.0096, respectively. Thus, the discrimination function has a moderate discriminating power as indicated by the low values for the eigenvalue and canonical correlation.

TABLE 8.38

CLASSIFICATION RESULTS

Actual	Group	No of Cases	Predicted Group1	Group Group2
Group	1	39	30	9
Korea			76.9	23.1
Group	2	19	6	13
11 Others			31.6	68.4

Percent correctly classified: 74.14%

Source: The output of SPSS (Discriminant Analysis Program) for question No.11.

Table 8.38, which indicates the effectiveness of the classification functions for the country groups, shows that 30 of 39 observations actually in group 1 were correctly assigned to group 1 by the classification function, and 13 of 19 observations in group 2 were correctly assigned to group 2. From a total of 58 observations (the sum of all four entries) 43 (74.14%) were correctly classified.

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Table 8.39 shows the discriminating variables which significantly discriminate between two groups, namely 16 plant exporters and 24 construction firms, from among four potential factors responsible for the success of Korean tenders for construction exports. Three variables significantly discriminate between the two groups.

TABLE 8.39

DISCRIMINATED SUMMARY TABLE

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V95		1	.941795	.1337	Supportive and sympathetic government policy
2	V94		2	.901453	.1467	Low wages
3	V97		3	.872177	.1725	Increased oil prices during the 1970s

Source: The output of SPSS (Discriminant Analysis) for question No. 11.

The group means[1] of these three variables are as follows:

	Plant	Construction		Plant	Construction
V95	3.875	4.625	V97	4.063	4.708
V94	5.375	5.708			

These show that construction exporters regard all three discriminated variables (V94, V95 and V97) as more important factors than plant firms do.

However, according to the output of SPSS Canonical Discriminant Functions (Discriminant Analysis Program) for question No.11, Xo is 4.992 and $X_{o.1,3}$ is 6.25[2]. Therefore, the null hypothesis is accepted ($X_o < X_{o.1,3}$) and we can conclude that there is no significant difference in the group centroids (plant and construction) at 0.1 significance level. With an eigenvalue, canonical correlation, Wilks lambda and significance of 0.147, 0.357, 0.872 and 0.172, respectively, the discrimination function lacks validity.

Table 8.40, which shows the effectiveness of the classification functions for the industry groups, indicates that 8 of 16 observations actually in group 1 were correctly assigned to group 1 by the classification function, and 17 of 24 observations in group 2 were correctly assigned to group 2. With 62.5 % of cases being correctly classified, the classification function is moderately effective.

TABLE 8.40

CLASSIFICATION RESULTS

Actual Group		No of Cases	Predicted Group1	Group Group2
Group	1	16	8	8
Plant			50.0	50.0
Group	2	24	7	17
Construction			22.2	77.8

Percent correctly classified: 62.50%

Source: The output of SPSS (Discriminant Analysis) for question No.11.

8.3.1.3 THE IMPORTANT FACTORS RANKED BY KOREAN AND FOREIGN FIRMS

As shown in Table 8.41, both Korean firms and international competitors consider low wages to be the most important factor in the success of Korean tenders for construction exports. This factor is ranked first by both groups, with a mean score > 5.564.

Korean firms regard increased oil prices during 1970s (V97) and a supportive and sympathetic government policy (V95) (such as a pool of cheap labour working in lieu of armed service) and financial support (foreign economic co-operation funds and deferred-payment funds) as the second and the third important success factors (with mean scores of 4.872 and 4.308, respectively). In contrast, foreign firms regard V95 and V96 (aptitude for new ventures) as the second and the third important factors in the success of Korean tenders.

TABLE 8.41

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO SUCCESS FACTORS IN TENDERS FOR KOREAN CONSTRUCTION EXPORTS

Variable Number	Factors	Weighted Mean Score	
		Korea (a)	11 other Countries(b)
V94	Low wages	5.564(1)	5.737(1)
*V95	Supportive and sympathetic government policy	4.308(3)	4.895(2)
V96	Aptitude for new ventures	3.744(4)	4.105(3)
*V97	Increased oil prices during 1970s	4.872(2)	3.789(4)

Source: Calculated from the output of SPSS (Discriminant Analysis Program) for question No.11. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: from 7 (extremely important) to 1 (extremely unimportant).

Note: 1. * represents significantly discriminated variables.
2. (a) 39 companies (b) 19 companies, 11 countries
3. Figures in brackets indicate ranking according to importance.

The major differences between the two groups were explained in section 8.3.1.2.

8.3.2 FAILURE FACTORS

In this sub-section, the important factors which explain bid failures for Korean construction exports are to be examined, followed by group comparisons (country and industry) to identify attitudinal differences which might be associated with failure. As before, the relative importance of these factors is determined from a ranking by 36 Korean and 13 foreign firms.

8.3.2.1 AN ANALYSIS OF FAILURE

Classical factor analysis, as described earlier, is again used for analysing failure factors, and rotation is again performed to maximise the variance explained by each successive element.

Table 8.42 shows the communalities and eigenvalues after rotation and iteration with respect to nine manifestation variables (as described in Table 8.48 and appendix 1). As shown in Table 8.42, two factors, with an eigenvalue > 1, explain 82.4 % of the total variance after rotation and capture most of the information measured by all variables (V103 to V111), of which factor 1 explains almost 56.0 %.

With respect to communality, 75.7 % of V111 (growth of exports on deferred payments) is explained by the retained factors, followed by high communality for V106 (low bids by some Korean business) and V105 (emergence of counter-trading). In contrast, only 7.9 % of V103 (over-dependence on the Middle-East market) is explained by the retained factors, followed by V108 (new market trends towards technology competition) as a variable with low communality.

TABLE 8.42

THE COMMUNALITIES AND EIGENVALUES AFTER ROTATION AND ITERATIONS

VARIABLE	COMMUNALITY	FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
V103	.07900	1	2.11324	55.7	55.7
V104	.41174	2	1.01669	26.8	82.4
V105	.53918	3	.66637	17.6	100.0
V106	.54529				
V107	.39259				
V108	.21610				
V109	.50336				
V110	.35179				
V111	.75724				

Source: The output of SPSS (Factor Analysis Program) for question No.12

In Table 8.43 the pattern suggested by the factor loadings is that failed tendering by Korean construction exporters is explained best by the following three factors:

Factor	Definition
1	Technology competition, incidental conditions imposed by importing countries, and low quality of bidder
2	Excessive competition between Korean firms
3	Unsuccessful market diversification and price disadvantage

Of these three factors, factor1 (technology competition, incidental conditions imposed by importing countries, and low quality of bidder) explains 55.7 % of the total variance and factor 2 (excessive competition between Korean firms) explains 26.8 % (see Table 8.42).

The policy/strategic recommendations which might follow from these indicators of failed tendering include:

TABLE 8.43

VARIMAX ROTATED FACTOR MATRIX AFTER ROTATION WITH KAISER NORMALISATION

VARIABLE	FACTOR 1	FACTOR 2	FACTOR 3
V103	.02619	.00054	.27985
V104	.44611	.27648	.36917
V105	.73253	-.04285	.02733
V106	-.02044	.71280	-.19181
V107	.23744	.01961	.57938
V108	.42744	-.08579	.16135
V109	.45782	.28892	-.45856
V110	.07182	.57060	.14509
V111	.80773	.30052	.12041

Source: The output of SPSS (Factor Analysis Program) for question No.12

1. A greater emphasis to be placed on technological innovation to induce a more competitive performance by Korean construction exporters, in recognition that comparative advantage is associated with a country's technological progress in consequence of major expenditure on R&D and an effective system of fundamental and applied research.
2. To respond positively to demands by importing countries for assistance with funding (such as supplier's credit and deferred-payment terms), which is the most important incidental conditions typically requested.
3. Action to reduce excessive competition among native Korean firms. In the Middle-East and African markets there has often been competitive bidding between rival Korean firms. Thus, the Korean government should restrict the number of contractors bidding overseas and insist that companies seek projects only if they are likely to be profitable.

4. Firms should commit themselves more to improving the technological quality of their products and maintaining their price competitiveness. As previously observed, the trend towards relatively high wage levels in Korea in recent years will need to be matched by productivity improvements to ensure competitive unit costs of production.

8.3.2.2 GROUP COMPARISONS

The group comparisons to identify attitudinal differences, using discriminant analysis, again involve the country groups (Korea and 11 other countries) and two industry groups (plant and construction) in this sub-section.

COUNTRY COMPARISONS

Table 8.44, from a usable sample of 36 Korean firms and 13 foreign firms, shows the discriminating variables which significantly discriminate between the two country groups from among nine factors in the failure of tenders for Korean construction exports.

In the table, five variables effectively discriminate between the two groups, and the inclusion of additional variables does not significantly improve further the discriminatory power of the function.

The most significantly discriminating variables are V107 (high wage levels of Korean employees) and V109 (poor quality construction in Korean firms). The least significantly discriminating variables are V111 (growth of exports on deferred payments) and V106 (low bids by some

Korean business). The group means[1] of these four variables are as follows:

	Korea	11 others		Korea	11 others
V107	4.222	3.000	V111	3.167	3.385
V109	1.694	3.154	V106	4.111	4.154

TABLE 8.44

DISCRIMINATED SUMMARY TABLE: COUNTRY GROUPS

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V107		1	.835037	.0038	High wage levels of Korean employees
2	V109		2	.699205	.0003	Poor quality construction
3	V105		3	.674365	.0005	Emergence of counter-trading
4	V106		4	.645682	.0006	Low bids by some Korean business
5	V111		5	.623194	.0008	Growth of exports on deferred payments

Source: The output of SPSS (Discriminant Analysis) for question No.12.

Comparing the two group means, Korean firms consider V107 (high wage levels of Korean employees) to have been the most important reason for failed Korean tenders for construction exports and V109 (poor quality construction) to be the least important reason among the five factors. In contrast, foreign firms regard V109 as a relatively more important reason and V107 as a relatively less important reason for the failure of Korean tenders. The group means of the other two variables (V106 and V111) are almost the same.

According to the output of SPSS Canonical Discriminant Functions (Discriminant Analysis Program) for question No.12, X_o is 21.044 and

$X_{0.005,5}$ is 16.7^2. Thus, the null hypothesis is rejected ($X_0 > X_{0.005,5}$), and we can conclude that there is a significant difference in group centroids (between Korea and 11 other countries) at a 0.005 significance level. The output of SPSS also shows that the eigenvalue, canonical correlation, Wilks lambda and significance are 0.605, 0.614, 0.623 and 0.0008, respectively. Since the eigenvalue, canonical correlation and significance are moderately supportive, the discrimination function has a moderate validity and discriminating power.

Table 8.45, which represents the effectiveness of the classification functions for the country groups, shows that 28 of 36 observations actually in group 1 were correctly assigned to group 1 by the classification function, and 10 of 13 in group 2 were correctly assigned to group 2. From a total of 49 observations 38 (77.55 %) were correctly classified.

TABLE 8.45

CLASSIFICATION RESULTS: COUNTRY GROUPS

Actual	Group	No of Cases	Predicted Group1	Group Group2
Group	1	36	28	8
Korea			77.8	22.2
Group	2	13	3	10
11 Others			23.1	76.9

Percent of grouped cases correctly classified: 77.55%

Source: The output of Classification Results (Discriminant Analysis Program) for question No.12.

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As can be seen in Table 8.46, beginning with V104, eight variables, from among nine potential factors responsible for the failure of Korean tenders for construction exports, effectively discriminate between the two industry groups (represented by 14 plant and 20 construction firms).

The most significantly discriminating variables are V104, V108 and V105. The least significantly discriminating variables are V111, V106 and V110. The group means' of these six variables are as follows:

	Plant	Construction		Plant	Construction
V104	3.857	5.150	V110	4.143	4.050
V108	3.571	4.900	V106	3.643	4.200
V105	3.429	3.600	V111	2.571	3.800

TABLE 8.46

DISCRIMINATED SUMMARY TABLE: INDUSTRY GROUPS

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V104		1	.687365	.0006	Growing competition in basic engineering
2	V108		2	.595801	.0003	New market trends moving toward technology competition
3	V105		3	.514526	.0002	Emergence of counter-trading
4	V107		4	.473347	.0002	High wage levels of Korean employees
5	V103		5	.453198	.0003	Over-dependence on the Middle-East market
6	V110		6	.431237	.0005	Excessive competitive bidding between rival Korean firms
7	V106		7	.403444	.0006	Low bids by some Korean firms
8	V111		8	.383354	.0009	Growth of exports on deferred payments

Source: The output of SPSS (Discriminant Analysis) for question No. 12.

The group means show that, compared with plant firms, construction exporters regard five of the six discriminated variables (the exception being V110) as more important factors responsible for the failure of Korean tenders for construction exports.

Since X_o is 26.846 and $X_{o.005,6}$ is 22.0^2, the null hypothesis is rejected ($X_o > X_{o.005,6}$) and we can conclude that there is a significant difference in group centroids (between plant and construction) at 0.005 significance level. The eigenvalue, canonical correlation, Wilks lambda and significance are 1.609, 0.785, 0.383 and 0.0008, respectively.

The results indicate that the discrimination function has a strong validity and discriminating power because the eigenvalue, canonical correlation and significance are strongly supportive.

Comparing the previous country groups with the industry groups, the eight discriminated variables of the latter (plant and construction) have more validity and a stronger discriminating power than the five discriminated variables of the former.

Table 8.47 shows the classification results for the industry group

TABLE 8.47

CLASSIFICATION RESULTS: INDUSTRY GROUPS

Actual	Group	No of Cases	Predicted Group1	Group Group2
Group Plant	1	14	13 92.9	1 7.1
Group Construction	2	20	2 10.0	18 90.0

Percent of grouped cases correctly classified: 91.18%

Source: The output of Classification Results (Discriminant Analysis Program) for question No.12.

analysis, which indicates the effectiveness of the classification functions.

The results in Table 8.47 indicate that 13 of 14 observations actually in group 1 were correctly assigned to group 1 by the classification function, and 18 of 20 observations in group 2 were correctly assigned to group 2. With 91.18 % of cases being correctly classified, the classification function is strongly effective.

8.3.2.3 THE IMPORTANT FACTORS RANKED BY KOREAN AND FOREIGN FIRMS

As shown in Table 8.48, both Korean plant and construction companies and those of 11 other countries consider Korean contractors' over dependence on the Middle-East market (V103), that is to say a failure to diversify their export markets, to be a greatly important factor in the failure of Korean tenders for construction exports. This factor is ranked first by both groups (with a mean score > 5.154). Both groups also consider growing competition for basic engineering from "low-wage" countries (V104) and new global market trends moving towards technology competition and away from price competition (V108) to be the second and the third important factors in the failure of Korean tenders.

These results reinforce the view that to export more successfully, Korean construction exporters should diversify their export markets and improve their technology levels.

Table 8.48 also shows that the failure factors with the greatest mean difference between Korea and 11 other countries are high wage levels of Korean employees (V107) and poor-quality construction by Korean firms (V109).

TABLE 8.48

A COMPARISON BETWEEN KOREA AND 11 OTHERS WITH REGARD TO FAILURE FACTORS OF TENDERS FOR KOREAN CONSTRUCTION EXPORTS

Variable Number	Factors	Weighted Mean Score	
		Korea (a)	11 Other Countries(b)
V103	Over-dependence on Middle-East market	5.528(1)	5.154(1)
V104	Growing competition for basic engineering	4.639(2)	4.538(2)
*V105	Emergence of counter-trading	3.639(7)	3.154(7)
*V106	Low bids by some Korean business	4.111(6)	4.154(4)
*V107	High wage levels of Korean employees	4.222(4)	3.000(9)
V108	New market trends moving towards technology competition	4.389(3)	4.538(2)
*V109	Poor-quality construction	1.694(9)	3.154(7)
V110	Excessive competitive bidding between rival Korean firms	4.222(4)	3.923(5)
*V111	Growth of exports on deferred payments	3.167(8)	3.385(6)

Source: Calculated from the output of SPSS (Discriminant Analysis Program) for question No.12. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: from 7 (extremely important) to 1 (extremely unimportant).

Note: 1. * represents significantly discriminated variables.
2. (a) 36 companies (b) 13 companies, 11 countries.
3. Figures in brackets indicate ranking according to importance.

8.4 REGRESSION MODELS OF SUCCESS AND FAILURE OF TENDERS FOR PLANT AND CONSTRUCTION EXPORTS

Despite the plethora of research, both theoretical and empirical, into the international dimensions of industries and markets, little work has been conducted into the growth and performance of firms in the plant and construction industry. This section introduces the first attempt anywhere to develop regression models to explain export success and failure in that industry. Specifically, multiple regression analysis is employed to investigate whether there is a linear regression between export volume (as a measure of export success and failure) and various quantitative and qualitative variables.

8.4.1 A REGRESSION MODEL OF EXPORT SUCCESS

This empirical research covers our sample of 42 Korean firms and 20 firms in 11 other countries. However, there are seven returns with missing data for which standard deviations of quantitative variables in the overall sample are too widely distributed for mean values to be substituted. This may be attributed to the following reasons: (1) the sample of Korean firms included small export firms; (2) in contrast, only large-sized export firms, among the top 160 international contractors, are included in the 11 other countries. Thus, to obtain better regression results, fifteen Korean firms (with an export volume < 15 USM$) and four foreign firms (with an export volume > 1 USB$) are excluded from the respective samples. Altogether, 36 international firms from 10 countries (exluding the U.K. and Turkey) constitute the sample for the regression models.

Of two regression models, the second one has a dummy variable to represent export "activity" (i.e. plant or construction).

TESTS

We can test the two hypotheses, which are as follows:

H_1: Export success in plant and construction markets is explained both by firm size and by various qualitative variables (described in section 8.2.1).

H_2: In addition, at least one dummy variable to represent export activity in plant or construction can add to the explanation of export success.

A stepwise regression procedure, the maximum R^2 improvement technique (MAXR), is used to test the significance of the variables in the model. MAXR calculates the R^2 improvement and the F-statistic reflecting each variable's contribution to the model if it were to be included. The MAXR method begins by picking the independent variable that explains most of the variation of the dependent variable and constructs a regression model with that variable. It then adds the second independent variable that would yield the greatest increase in R^2 by comparing each variable with all other independent variables and doing all possible switches until no further switch could increase R^2. Thus, independent variables continue to be brought into the model as long as the unexplained variation (MSE) continues to decrease. In this manner, the "best" model can be obtained.

For testing purposes, the specification of the first model is given in the linear form:

$$V436 = b_0 + b_1V43 + b_2V50 + b_3V51 + b_4V54 + b_5V55 + b_6V432 + b_7V434 + e \quad (1)$$

where V436 = high export volume in 1986:US 0.1M$

V43 = competent knowledge of the plant and construction markets

V50 = mutual economic co-operation

V51 = mutual co-operative arrangements, with a consulting firm taking charge of feasibility study

V54 = quality guarantee of products exported

V55 = financial arrangements

V432 = number of employees

V434 = sales volume in 1986:USM$

We can test the null hypothesis that there is no relationship between export volume and the seven independent variables.

$$Ho: b_1 = b_2 = b_3 = b_4 = b_5 = b_6 = b_7 = 0$$

$$Ha: \text{at least one } b \neq 0$$

where b_1 to b_7 are the coefficients of each independent variable. The critical (rejection) region to test the null hypothesis is:

$$\text{Reject Ho if } F_o > F_{\alpha, v_1, v_2}$$

where F_{α, v_1, v_2} is the F-value of F-distribution with v_1, v_2 degrees of freedom which is exceeded with probability α.

Amongst seven independent variables, V432 and V434 are quantitative raw variables as a measure of firm size; the remaining five are qualitative ones (measured from a seven point bi-polar rating scale).

The second model is represented by nine independent variables including one dummy variable, D_2, which takes a value of one when the export activity refers to construction and zero value otherwise.

The model specification, using the one dummy variable, is also given in a linear form:

$$V436 = b_0 + b_1V42 + b_2V44 + b_3V50 + b_4V51 + b_5V53 + b_6V54 + b_7V55 + b_8V432 + b_9D_2 + e \quad (2)$$

where V436 = high export volume in 1986: US 0.1M$

V42 = reputation and past record

V44 = experience of tender process

V53 = negotiating ability with foreign government officials

D_2 = export activity (construction)

V50, V51, V54, V55 and V432 were defined previously in equation (1).

The null hypothesis that there is no relationship between export volume and the nine independent variables is represented as follows:

$$Ho: b_1 = b_2 = b_3 = b_4 = b_5 = b_6 = b_7 = b_8 = b_9 = 0$$

$$Ha: \text{at least one } b \neq 0$$

REGRESSION RESULTS

The test results for equation (1) are presented in Table 8.49. In step one, MAXR procedure entered V50 (mutual economic co-operation) first as the best one-variable model with R^2 equal to 21.2%. As shown in the table, the predictive power of the model increased to 41.4% when V432 (number of employees) was included, to 53.1% for V54 (quality guarantee of products exported), and to 61.4% for V51 (mutual cooperation with a consulting firm). When all seven variables were included, the predictive power of the model increased to 72.9%.

According to the output of SPSS Multiple Regression Analysis, Fo is 10.772 and $F_{0.025,7,28}$ is 2.78[a]. Therefore, Ho is rejected ($Fo > F_{0.025,7,28}$) and we can conclude that there is a significant difference in the coefficients of each independent variable.

TABLE 8.49

REGRESSION RESULTS AS A MEASURE OF EXPORT VOLUME

Coefficients of

Variable Number	Factors	Intercept	F Value	R^2 Improvement	Adj R^2
V50(1)	Mutual economic co-operation	619.2	10.360[a]	.212	
V432(2)	Number of employees	.108	12.436[a]	.414	
V54(3)	Quality guarantee of products exported	471.4	10.512[a]	.531	
V51(4)	Mutual co-operation with a consulting firm	-443.8	5.772[c]	.614	.662
V55(5)	Financial arrangements	407.0	9.220[b]	.675	
V434(6)	Sales volume in 1986	.318	4.280[d]	.714	
V43(7)	Competent knowledge of plant and construction markets	-251.4	1.609	.729	
b_0	Constant	-2960.0	5.154[d]		
	Overall		10.772[a]	.729	.662

Source: The output of SPSS (Regression Analysis) for question No.2 and 6.

Note: The numbers in parentheses denote the sequence in which each variable entered the model, and [a,b,c,d] represent the significance level of 0.1%, 1%, 2.5% and 5%, respectively.

The regression results in Table 8.49 indicate that about 73.0% of export volume is explained by these explanatory variables at 0.000 significance level. The results also indicate that the high export volume of plant and construction exporters is more strongly influnced by mutual economic cooperation and number of employees rather than by sales volume and competent knowledge of the overseas plant and construction markets.

A linear form of the regression model can be represented as follows:

High export volume = $-2960.0 + 619.2V50 + 0.108V432 + 471.4V54$

$-443.8V51 + 407.0V55 + 0.318V434 - 251.4V43 + e$

The regression model of equation (1) does not suffer from multi-collinearity problem[4] because the largest intercorrelation coefficient between dependent variables is smaller than 0.40.

The test results for equation (2), using one dummy variable, are presented in Table 8.50. Among the nine variables, V50 again entered first as the best one-variable model with R^2 equal to 21.2%. The predictive power of the model increased up to 85.1% after all nine explanatory variables entered equation (2). That is to say, about 85% of high export volume is explained by these nine variables in the model at 0.000 significance level.

The coefficients of V50 and V432 among the nine independent variables are highly significant (at the 0.1% level), suggesting that mutual economic co-operation (trade, joint-ventures, loans and technology supply) and the size variable, number of employees, contribute to export volume in the model containing the dummy variable (D_2).

Comparing D_1 (plant) with D_2 (construction), the coefficient of D_1 is negative and statistically insignificant. Thus, D_1 (plant) was not included in equation (2). However, that of D_2 is positive and statistically significant (at the 0.5% level), suggesting that the high export volume of plant and construction exporters can be explained not by plant exports but by construction exports. This result might arise because: (1) the export volume (group mean of 15 construction export firms) of construction firms is about five times as much as that (group mean of 10 plant export firms) of plant exporters (US 16.7M$ vs. 3.3M$) and (2) the sales volume (group mean) of construction firms is about two and half times as much as that of plant exporters (US 972M$ vs. 394M$).

TABLE 8.50

REGRESSION RESULTS USING DUMMY VARIABLE AS A MEASURE OF EXPORT VOLUME

Coefficients of

Variable Number	Factors	Intercept	F Value	R^2 Improvement	Adj R^2
V50(1)	Mutual economic co-operation	827.1	26.381[a]	.212	
V432(2)	Number of employees	.110	24.157[a]	.414	
D_2(3)	Construction	1760.5	25.359[a]	.548	
V51(4)	Mutual co-operation with a consulting firm	-373.2	6.098[c]	.653	
V54(5)	Quality guarantee of products exported	406.0	11.351[a]	.744	.800
V44(6)	Experience of tender process	-301.6	6.287[c]	.779	
V42(7)	Reputation and past records	368.5	3.689[d]	.801	
V55(8)	Financial arrangements	277.4	6.581[b]	.829	
V53(9)	Negotiating ability with foreign government officials	-284.7	3.905[d]	.851	
b_0	Constant	-4094.8	13.274[a]		
	Overall		16.547[a]	.851	.800

Source: The output of SPSS (Multiple Regression Analysis Program) for question No.2 and 6.

Note: The numbers in parentheses denote the sequence in which each variable entered the model, and [a,b,c,d] represent the significance level of 0.1%, 1%, 2.5% and 5%, respectively.

Equation (2) in linear form can be represented as follows:

$$\text{High export volume} = -4094.8 + 827.1V50 + .110V432 + 1760.5D_2 -373.2V51 + 406.0V54 - 301.6V44 + 368.5V42 + 277.4V55 - 284.7V53 + e$$

According to the output of SPSS Multiple Regression Analysis, using one dummy variable, Fo is 16.547 and $F_{0.025,9,26}$ is 2.65[3]. Thus, the null hypothesis is again rejected ($Fo > F_{0.025,9,26}$), and we can conclude that there is a significant difference in the coefficients of each independent variable and the two hypotheses defined above (H_1 and H_2) can be accepted.

The regression model of equation (2) does not suffer from a multi-collinearity problem[4] because the largest intercorrelation coefficient between dependent variables is smaller than 0.57.

Comparing Table 8.49 with Table 8.50, the predictive power of the model increased from 72.9% to 85.1%, most of which may be attributed to the dummy variable, D_2. That is to say, discrimination by export activity (construction) improves the predictive power of the export success (high export volume) model.

It is expected that the above models could be used as a guideline for predicting export success in the international plant and construction industry.

8.4.2 A REGRESSION MODEL OF EXPORT FAILURE

The sample firms analysed in this sub-section are the same as those of the previous model. Two regression models are again presented in this sub-section with the same method used in the previous one.

TESTS

We can test the following hypotheses:

H_1: Export failure in plant and construction markets is determined both by firm size and by various qualitative variables which explain bid failure (explained in section 8.2.2).

H_2: In addition, at least one dummy variable to represent export activity (plant or construction) can add to the explanation of export failure (low export volume).

The stepwise regression procedure, the maximum R^2 improvement technique (MAXR), is again used to test the significance of the variables in the model.

The multiple regression model given in linear form is as follows:

$$V436 = b_0 + b_1 V56 + b_2 V58 + b_3 V59 + b_4 V62 + b_5 V64 + b_6 V67 + b_7 V69 + b_8 V432 + b_9 V434 + e \qquad (3)$$

where V436 = low export volume in 1986: US 0.1M$

V56 = price disadvantage

V58 = weak package (e.g. technology, installation, construction and funds)

V59 = late delivery date

V62 = lack of bid experience

V64 = unsatisfactory payment conditions

V67 = weak political and diplomatic relation between countries

V69 = lack of mutual economic co-operation (trade, joint-ventures, loans and technology supply)

V432 = number of employees

V434 = sales volume in 1986: USM$

The second model is represented by one dummy variable, D_1, which takes a value of one when the export activity refers to plant and zero value otherwise.

The model specification, using the one dummy variable, is also given in linear form:

$$V436 = b_0 + b_1 V57 + b_2 V58 + b_3 V62 + b_4 V67 + b_5 V68 + b_6 V69 + b_7 V432 + b_8 V434 + b_9 D_1 + e \qquad (4)$$

where V436 = low export volume in 1986: US 0.1M$

V57 = low technology

V68 = lack of traditional cultural link

D_1 = export activity (plant)

V58, V62, V67, V69, V432 and V434 were defined in equation (3).

The null hypothesis is again used to test whether there is a relationship between low export volume and nine independent variables.

$$Ho: b_1 = b_2 = b_3 = b_4 = b_5 = b_6 = b_7 = b_8 = b_9 = 0$$

$$Ha: \text{at least one } b \neq 0$$

REGRESSION RESULTS

Table 8.51 shows the regression results for equation (3). Among the nine variables, the MAXR procedure entered V67 first as the best one-variable model with R^2 equal to 24.8%. As shown in the table, the predictive power of the model increased to 41.7% when V434 was included in step two, to 48.6% for V62, to 54.3% for V58, and to 58.6% for V432. When all nine variables were included in equation (3), the predictive power of the model increased to 69.1%. That is to say, the regression results indicate that 69% of low export volume is explained by firm size and the qualitative variables at 0.000 significance level.

TABLE 8.51

REGRESSION RESULTS AS A MEASURE OF EXPORT VOLUME

Coefficients of

Variable Number	Factors	Intercept	F Value	R^2 Improvement	Adj R^2
V67(1)	Weak political and diplomatic relation	627.7	5.967[a]	.248	
V434(2)	Sales volume in 1986	.548	9.154[b]	.417	
V62(3)	Lack of bid experience	-775.0	13.658[a]	.486	
V58(4)	Weak package (e.g. technology, construction and funds)	501.6	5.532[c]	.543	
V432(5)	Number of employees	.083	4.044[d]	.586	
V64(6)	Unsatisfactory payment conditions	293.7	3.740[d]	.616	.575
V69(7)	Lack of mutual economic co-operation	418.6	2.417	.634	
V56(8)	Price disadvantage	1129.9	3.168[e]	.658	
V59(9)	Late delivery date	-337.7	2.522	.691	
b_0	Constant	-10719.4	5.236[c]		
	Overall		5.955[a]	.691	.575

Source: The output of SPSS (Multiple Regression Analysis Program) for question No.2 and 7.

Note: The numbers in parentheses denote the sequence each variable entered the model, and a,b,c,d,e represent the significance level of 0.1%, 1%, 2.5%, 5% and 10%, respectively.

Among the nine explanatory variables, the coefficients of V67, V434 and V62 are statistically very significant (at the 2.2%, 0.6% and 0.1% level, respectively), suggesting that weak political and diplomatic relation between countries, low sales volume and lack of bid experience have an adverse effect and represent serious barrier to exports. This finding is consistent with the factor analysis in section 8.3.2.

We can express the equation (3) in linear form as follows:

$$\text{Low export volume} = -10719.4 + 627.7V67 + .548V434 - 775.0V62 + 501.6V58 + .083V432 + 293.7V64 + 418.6V69 + 1129.9V56 - 337.7V59 + e$$

Since Fo is 5.955 and $F_{0.025,9,24}$ is 2.70[3]. Hence, Ho is rejected ($Fo > F_{0.025,9,24}$) and we can conclude that there is a significant difference in the coefficients of each independent variable.

The regression model of equation (3) does not suffer from multi-collinearity problem[4] because the largest intercorrelation coefficient between dependent variables is smaller than 0.55.

Comparing Table 8.49 with Table 8.51, the predictive power of the export success model is stronger than that of the export failure model.

Table 8.52 shows the regression results, using the one dummy variable (D_1), for equation (4). Among the nine variables, the MAXR procedure again entered V67 first as the best one-variable model with R^2 equal to 24.8%. As shown in the table, the increase in the predictive power of the model exactly matches Table 8.51 up to and including V432. When all nine variables, including D_1 (plant), entered equation (4), the predictive power of the model increased up to 70.2%. That is to say, about 70% of low export volume is explained by these variables including D_1 at 0.000 significance level.

TABLE 8.52

REGRESSION RESULTS USING DUMMY VARIABLE AS A MEASURE OF EXPORT VOLUME

Coefficients of

Variable Number	Factors	Intercept	F Value	R^2 Improvement	Adj R^2
V67(1)	Weak political and diplomatic relation	511.2	3.006[c]	.248	
V434(2)	Sales volume in 1986	.505	9.135[b]	.417	
V62(3)	Lack of bid experience	-366.2	2.994[e]	.486	
V58(4)	Weak package (e.g. technology, construction and funds)	784.9	5.570[c]	.543	
V432(5)	Number of employees	.105	6.502[c]	.586	
D_1(6)	Plant (export activity)	-1356.3	4.945[c]	.621	.591
V57(7)	Low technology	-672.7	3.845[d]	.654	
V69(8)	Lack of mutual economic co-operation	388.6	2.271	.677	
V68(9)	Lack of traditional cultural link	-384.9	2.078	.702	
b_0	Constant	-631.7	0.243		
	Overall		6.293[a]	.702	.591

Source: The output of SPSS (Multiple Regression Analysis Program) for question No.2 and 7.

Note: The numbers in parentheses denote the sequence each variable entered the model, and a,b,c,d,e represent the significance level of 0.1%, 0.5%, 2.5%, 5% and 10%, respectively.

We can express the equation (4) in linear form as follows:

Low export volume = -631.7 + 511.2V67 + .505V434 - 366.2V62 + 784.9V58

$$+ .105V432 - 1356.3D_1 - 672.7V57 + 388.6V69$$
$$- 384.V68 + e$$

Since Fo is 6.293 and $F_{0.025,9,24}$ is 2.70[3], Ho is also rejected ($Fo > F_{0.025,9,24}$) and we can conclude that there is a significant difference in the coefficients of each independent variable. However, the regression model of equation (4) suffers from an extreme multicollinearity problem[4] because the largest intercorrelation coefficient between the dependent variables is bigger than 0.80 (the simple correlation between V57 and V58: 0.846). Therefore, there is no acceptable way to perform regression analysis using the given set of independent variables.

It can be argued that whereas equation (3) could be used as a guideline for predicting export failure in the international plant and construction industry, equation (4) suffers from an extreme multi-collinearity problem.

In conclusion, the results of this study show that export successes and failures in plant and construction export markets are determined by firm size and various qualitative variables. The results also show that in addition to these variables, the one dummy variable (D_2) to represent export activity in construction can add to the explanation of export success.

8.5 SUMMARY AND CONCLUSIONS

This chapter set out to interpret and investigate the findings of the survey with regard to: (1) comparisons of firm size, market share, firm objectives and major export regions between a) Korea and developed countries and b) plant and construction export firms; (2) the determinants of successful/failed tenders for plant and construction exports and for Korean construction exports; and (3) a regression model to explain the determinants of, respectively, export success and export failure.

Country and Industry Comparisons of Firm Size, Market Share, Firm Objectives and Major Export Regions

The analysis of firm size indicated that among Korean firms there is a need and considerable scope for increases in labour productivity and for a re-assessment of resource use as evidenced by relatively low sales volume per employee and under-capitalisation.

In comparisons of market share, firms with relatively large sales volume in the developed countries were found to sell their products more in their domestic market than in foreign markets. However, large-sized Korean firms appeared to be more dependent upon foreign markets and export performance than on the domestic market and, in consequence, are more vulnerable than their competitors to fluctuations in world demand. This fact can be verified by statistical data*. Thirteen large-sized construction firms in developed countries (surveyed in this research) won 35.7% of their total sales volume (US 28,109.9M$) in 1986 in foreign markets and 64.3% in their domestic market. In contrast to this, eleven large-sized firms in Korea won 52.1% of their total sales volume (US 4,632.4M$) in foreign markets. And three large-sized firms in developing countries, namely, Turkey, Taiwan and Singapore, which appeared in this research sample, won 64.8% of their total sales volume (US 2,773M$) in foreign markets. This pattern may be attributed to a number of factors. Large-sized firms in developed countries are less dependent on foreign markets because of dominant market share in their domestic market, and their small and medium-sized firms can compete with the large firms from developing countries in foreign markets because the gap in capital, technology and international competitive power between large and small-sized firms in developed countries is fairly narrow. Compared with developed countries Korea is not blessed with natural resources, but possesses abundant and cheap manpower which has sustained government led export promotion policies since 1960. In addition, the Korean domestic plant and construction market is relatively limited and the gap in capital, technology and international competitive power between large and small-sized Korean firms is fairly wide.

In a comparison of firms' major export markets, both Korea and developed countries regard the Middle-East as an important export region, but developed country firms are more strongly represented. Elsewhere Korean plant and construction firms show a stronger commitment to South-East Asia, and developed country firms to Africa. The differences can be attributed to "psychic distance" which offers Korean firms location specific advantages in South-East Asia and developed country firms advantages in Africa.

Plant exporters were found to be more capital intensive and more export oriented than construction firms. Plant exporters with the highest ratios of R & D expenditure to sales volume regard the EEC as an important export region; construction exporters, in general, were biased against Africa. Those Korean firms which identified capacity utilisation as very important regard the USA as a less important export region(in contrast to developed country firms which regard the USA as a very important export region). A major reason for this is the restrictions which are placed in North America, by quota, on imports of steel frame components from Far Eastern producers[6]. In response, Korean firms have concentrated on small and medium-sized plant exports to the South-East and west Asian markets where they experience similarities in culture, business and customs and, therefore, enjoy location-specific advantages. In any event, Korean construction firms attempting to penetrate the North American market have been much less competitive in technologiical and financial aspects as compared with developed country firms.

Construction firms in developed countries which sell their products more in foreign than in the domestic market consider that there are more possibilities for expansion within the Middle-East than in the USA market. However, among Korean firms, there were no significant correlations between foreign market share and these two major export regions. The construction contract value of developed countries in the Middle-East in 1985 and 1986 totaled US 37.7B$, a share ratio of 56.5%, and the balance (43.5%) was shared among three developing countries, namely, Korea, Turkey and Yugoslavia. In contrast, the contract value of developed countries in North-America for the same period was totalled US 20.6B$, a share ratio of 100%[7].

Plant exporters which, relative to construction firms, consider sales growth and labour productivity to be major objectives sell their products less in foreign markets than in the local market, in contrast to construction firms which, in general, sell their products more in foreign markets than in the local market. This pattern may be explained by the fact that plant firms are more capital intensive and less labour intensive and therefore less competitive internationally than construction firms.

Factors Associated with the Success and Failure of Tenders for Plant and Construction Exports

Successful tendering can best be explained by the following five factors: (1) co-operation with importing countries (joint-ventures, mutually co-operative arrangements and consortia membership); (2) the quality of bids (meeting delivery date, after-sales service, product quality and experience of the tender process); (3) relationships with importing countries (close political and cultural ties); (4) incidental conditions imposed by importing countries (e.g. demands for favourable and competitive credit terms and a commitment to high local procurement ratios); and (5) price competitiveness.

In the discriminant analysis, nine of 18 variables effectively discriminate between firms from Korea and the 11 other countries, and show a strong discriminating power and significance level. Among these nine variables, the most significant are mutual co-operation with consulting firm and close political and diplomatic relation between countries. Four of 18 variables significantly discriminate between plant and construction export firms, but offer a less valid discrimination function than the country group model. Of these four variables, competitive payment conditions and experience of the tender process are the most significant variables.

All firms, in Korea and elsewhere, regard price competitiveness and an attractive bid package (e.g. technology, installation, construction and funds) as the most important success factors. In addition, Korean firms consider technological attributes to be important.

The reason for failed tenders for plant and construction exports can best be explained by the following four factors; (1) inadequate co-operation with importing countries via government and commercial channels; (2) low quality of bids; (3) weak commercial ties (no involvement in consortia bids or interaction with consultant firms); and (4) price disadvantages. The test results, which reveal a strong discriminating power and significance level, show that eleven of 19 variables discriminate effectively between Korea and the rest. Among these variables, the most significantly discriminating variables are weak political and diplomatic relationships and date of delivery. Only six variables of 19 effectively discriminate between the two industry groups, with a moderate validity and discriminating power. Among these variables, the most significantly discriminating variables are an inability to offer adequate financial arrangements, poor reputation and past record, and weak political and diplomatic relations. Overall, the country model has more validity and a stronger power to discriminate than the industry model.

The study also found that all international plant and construction firms consider price disadvantage to be a greatly important factor in the failure of tenders or poor performance in both plant and construction exports, and poor after-sales service and a lack of traditional cultural link to be relatively less important factors. Price competitiveness, or a lack of it, is considered to be greatly important, respectively, for success and failure by both groups.

<u>Success and Failure Factors Associated with Tenders for Korean Construction Exports</u>

Successful tendering for Korean construction exports is explained best by the following three factors: (1) quality of the bidder (a more supportive and sympathetic government policy and encouragement of new ventures directed towards exporting); (2) increased oil prices; and (3) low wages.

Increased oil prices during the 1970s and a supportive and sympathetic government policy effectively discriminate between Korea and the other countries, with a moderate discriminating power. Korean firms consider V95 (a supportive and sympathetic government policy) to be relatively less important than increased oil prices during the 1970s, whereas foreign firms consider V95 to be a more important reason for Korean success.

There was no significant difference in the group centroids (plant and construction) at 0.1 significance level in the analysis of the success of tenders for Korean construction exports. Both Korean firms and international competitors consider low wages to be the most important factor.

Failed tendering by Korean construction exporters is explained best by the following three groups of factors: (1) technology competition, incidental conditions imposed by importing countries, and low quality of bidder; (2) excessive competition between Korean firms; and (3) unsuccessful market diversification and price disadvantage.

Five of nine variables discriminate effectively between Korea and the other countries, with a moderate validity and discriminating power. Among these five, the most significantly discriminating variables are high wage levels of Korean employees and poor quality construction by Korean firms. Comparing the two group means, Korean firms consider high wage levels of Korean employees to have been the most important reason for failed Korean tenders for construction exports. In contrast, foreign firms regard poor quality construction as a relatively important reason.

Of nine potential factors responsible for the failure of Korean tenders for construction exports, eight effectively discriminate between the two industry groups, with a strong validity and discriminating power. The most significantly discriminating variables are a) a growth in competition for basic engineering and b) new market trends towards technology competition. The industry model had more validity and a stronger discriminating power than the country model.

Plant and construction companies in all countries consider Korean contractors' over-dependence on the Middle-East market to be a greatly important factor in the failure of Korean tenders for construction exports elsewhere.

Regression Models of Success and Failure of Tenders for Plant and Construction Exports

Export success and failure in plant and construction export markets is determined by firm size and by various qualitative variables. In addition to these variables, the one dummy variable (D_2 for construction) to represent export activity in construction adds to the explanation of export success.

The high export volume (export success) of plant and construction exporters is more strongly influenced by mutual economic cooperation and number of employees than by sales volume and competent knowledge of the plant and construction markets. It was also found that weak political and diplomatic relation between countries, low sales volume and lack of bid experience have an adverse effect and represent serious barriers to exports.

The predictive power of the model is improved with the inclusion of the dummy variable. In other words, the industry effect (construction) cannot be ignored in explaining high export volume.

NOTES

1. Calculation was based on multiplying the frequency count of each scale (a seven-point bi-polar rating scale) by weights given to these values: from 7 (extremely important) to 1 (extremely unimportant).

2. Donald L. Harnett(1982), Statistical Methods, Third edition (Addition-Wesley Publishing Company), Appendix B pp.A-46, Table V, Critical Values of the X Distribution.

3. Donald L. Harnett(1982), Statistical Methods, Third edition (Addition-Wesley Publishing Company), Appendix B pp. A-51, Table VIII(b), Critical Values of the F-Distribution(α=.025).

4. Norman H. Nie et al (1975), SPSS: Statistical Package for the Social Sciences (2nd Edition), McGraw-Hill Book Co., New York, pp. 340-341.

5. Engineering News Record, July 16, 1987.

6. The Status of Plant Exports, the Ministry of Trade and Industry, Seoul Korea, January 1987.

7. Engineering News Record, July 17, 1986 and July 16, 1987.

CHAPTER 9

CASE HISTORIES OF FOUR CONTRACTS BY KOREAN FIRMS

There is a dearth of authoritative, comprehensive and multidisciplinary studies on the causes of success and failure across the broad range of major plant and construction projects.

Many major projects are completed late, are over budget, do not perform in the way expected or are even cancelled prior to their completion after the expenditure of considerable sums of money. As a result, contractors often incur losses, and owners frequently obtain projects late at costs which make them unprofitable. Given the large size of a major project investment, the costs of failure are dangerously high. Hence, we need to improve our understanding of how major projects can be accomlished successfully.

This chapter introduces the case histories of four successful tenders by Korean firms, of which two describe plant exports.

Project success or failure is assessed by the following three measures, which have already been used by Morris and Hough (1986).

* <u>Project functionality</u> - did the project perform financially, technically or otherwise in the way expected?
* <u>Project implementation</u> - was the project implemented to budget, on schedule, to technical specification?
* <u>Contractors' commercial performance</u> - did those who provided a service to the project benefit commercially?

The purposes of the case histories are to assess the degree of success or failure (using the measures described above) and to identify factors which might be considered as pre-conditions to success or failure.

With these criteria in mind, the following four projects were selected as case histories:

1. Bombay offshore oil production project in West India.
2. Jubail industrial harbour works, Saudi Arabia.
3. SM-CF factory construction project, Iraq.
4. AK-PH(1) housing construction project, Saudi Arabia.

9.1 BOMBAY OFFSHORE OIL PRODUCTION PROJECT IN WEST INDIA[1]

9.1.1 INTRODUCTION

This case illustrates a successful tender rather than a successful contract (which is still under construction).

Since 1985 ocean production of oil has been stagnant due to a depressed oil market, in consequence of which clients have frequently postponed or cancelled potentially unprofitable projects.

Under these market circumstances Hyundai Heavy Industries Ltd. (Hyundai HI) received an order for a large offshore oil production installation from the Oil and Natural Gas Commission (ONGC), India, in December 1986. The value of the received order, incorporating three projects, amounted to US 250M$.

The three projects, named "IABCD", "ICP" and "ICW", are as follows:

1. IABCD (Infill Well Platforms IA, IB, ID and ICD, Bombay High Field Project) was to design, produce, transport, install and test-run four well platforms each capable of producing crude oil at the rate of seventy five thousands barrels per day;
2. ICP (ICP Process Platform Complex, Bombay High South Field) was to

build a large complex composed of three platforms and a submarine oil pipeline with a length of 110 km to process and transport one hundred thousand barrels of oil and three million cubic metre of natural gas per day to the shore; and

3. ICW (ICW Process Platform - Infill Complex, Bombay High Offshore Project) was to build one platform to process 250,000 barrels of sea water for injection per day to submarine oil wells.

The three projects are closely connected.

9.1.2 INTERNATIONAL COMPETITION FOR THE RECEIVING ORDER

In January 1985, Hyundai HI collected the information with regard to the Bombay Offshore Oil Production Project. Hyundai HI's business strategy, devised in January 1985, was to compete successfully in the stagnant offshore oil production installation markets.

Firms from developed countries competed strongly for the order by offering long-term financial support with an interest rate of 1.5% per annum and gratuitous economic aid. Firms from the least developed of developing countries also competed by offering competitive tenders which, if accepted, threatened their ability to avoid heavy losses. Under these conditions, the successful bidder was likely to have to operate on very fine profit margins.

Twelve firms took part in the tender for the IABCD project, which closed on 21st November 1985, and 21 firms tendered for the ICP and ICW projects, which closed on 29th January 1986. Hyundai HI's tender price, the outcome of formal and informal estimates, calculated by overseas branches of the firm and by head office estimation, turned out to be the lowest tender in all three projects.

Nevertheless, Hyudai HI received a re-tender request with respect to the IABCD project from ONGC on 13th May 1986. This was attributed by Hyundai HI to extremely profitable financial packages which competitors in developed countries presented to ONGC and to strong lobbying activities by competitors during the long period taken to assess tender documents. Taking advantage of the depressed market, ONGC had already demanded a price reduction from the potential bidders before the opening of the bids and actual bidders were also pressed to make price reductions.

Hyundai HI took part in the re-tender, but without any further price reduction, on 19th June 1986. This decision was based on a close analysis of competitors' probable prices. However, the re-tender result showed that the re-tender price of National Petroleum Corporation Company (NPCC in U.A.E.), originally in seventh position, was US 15.80M$ below its original tender price and by far the lowest bid. Hyudai HI was the second lowest (with a bid of US 36.80M$).

Many bidders for the ICP and ICW projects withdrew at the documentary investigation stage or engaged in fresh consortia bids. The strongest competitors were Japan Steel Corp., McDermott Inc. (USA) and Samsung Construction Co. Ltd.(Korea) in the ICP project; Sumitomo Construction Co. Ltd. (Japan) and Japan Steel Corp. in the ICW project. Hyundai HI turned out to be the lowest bidder in both projects.

Hyundai HIs position as the lowest bidder was challenged by a number of competitors during the period from 30th June (bid announcement) to 1st December 1986 (contract date). In particular, Japanese competitors engaged in lobbying activities and made promises of aid via the Japanese government.

During this period Hyundai HI requested formally that ONGC increase the original bid price by 10.0% for the ICP project and by 8.0% for the ICW project (30th October 1986) because ONGC could not give a guaranteed starting date for the project. In these circumstances, success of the contract was threatened by price increases by manufacturers, appreciation of the won and the yen (unit of currency in Korea and Japan, respectively), and a change of installation time.

By persistent endeavour, Hyundai HI finally received an intention paper for the order from ONGC on 1st December 1986 with a price of US 192M$, an increase of 7.0% (US13M$) over the original bid price. Thus, Hyundai HI received the order for the three projects with a total bid price of over US 250M$ including financial support.

9.1.3 FACTORS IN SUCCESS

One reason for the award of the tender was Hyundai's competence with five large-sized offshore oil production installations which Hyundai HI had received from ONGC since 1982 (contract volume: total US 600M$). In the process of accomplishing these projects, Hyundai HI had given evidence of its technological excellency in equipment manufacture and its ability to successfully finish large turnkey projects within the delivery date. That is to say, reputation (e.g. meeting delivery date & product quality) and past record played a decisive role in winning the bid.

Secondly, Hyundai HI's continuous contact and negotiation with ONGC played an important role. Although Hyundai HI was the second lowest bidder after NPCC (U.A.E.) in the IABCD re-tender, Hyundai HI persuaded

ONGC to accept that Hyundai HI could accomplish the IABCD project within a shorter construction period than could NPCC because of Hyundai HI's past construction experience with ONGC and its accumulated technology. Hyundai HI also persuaded ONGC to treat the three projects as one project, which Hyundai HI was capable of handling. When the bids for these projects were separated by upper(IABCD) and lower(ICP and ICW) part construction, Hyundai HI was still the lowest bidder in the lower part construction.

Thirdly, Hyundai HI emphasised to the client(ONGC) that since the three projects actually formed one offshore oil production complex, accepting Hyundai HI as the contractor for all three would bestow the following benefits:
(1) ONGC would save on the cost of construction supervision through a simultaneous supervision of the three projects; (2) a single contractor would solve the interference problems between each contractor which would inevitably occur in the case of separate tenders; and (3) in the event that the tender was awarded to the nearest rival, NPCC, it was successfully argued by Hyundai HI that this rival was unlikely to meet the deadline date, thus incurring heavy extra costs.

9.2 JUBAIL INDUSTRIAL HARBOUR WORKS, SAUDI ARABIA[2]

9.2.1 INTRODUCTION

The Jubail Industrial Harbour Works, the largest construction project to date in the 20th century, roused a greater interest among foreign countries than in Korea because of the super scale of the contract, worth US 958M$. Apart from its large scale, the project combined construction work with an unusual variety of engineering works and buildings, and electrical and other installations on land and at sea. In particular, the Open Sea Tanker Terminal (OSTT) Works, which has a simultaneous berthing capacity of four berths up to a maximum 300,000ton class, involved a complex of large scale construction work ranging from frame manufacture to transport, cargo work and establishment. Following a successful tender, Korea would be in a position to develop ocean frame technology, which had been monopolised by a handful of advanced countries.

9.2.2 THE BACKGROUND TO THE WINNING ORDER BY HYUNDAI ENGINEERING AND CONSTRUCTION COMPANY LTD.

Jubail Industrial Harbour Project, under the auspices of the Saudi Ports Authority (SPA), was to be a new harbour construction works for industrial facilities in the Jubail area, the eastern oil field of Saudi Arabia. Bids were invited on 16th February 1976.

Formerly the Middle-East construction market had been monopolised by firms from developed countries. But in July 1975, Hyundai Engineering & Construction Co., Ltd. (Hyundai E&C) obtained the information appertaining to a harbour works in Saudi Arabia with a value of US 1B$. Construction companies from the U.S.A., the U.K., West Germany, the Netherlands and elsewhere (representatives of the leading construction export countries in Europe and America) had been preparing their estimates in support of a winning bid for several years, and had greatly influenced the design and scale of the project from its initial conception.

Despite these disadvantages, Hyundai E&C committed itself to compete for the project, and in recognition of the seriousness of its intentions was invited to the tender (in December 1975) together with established construction firms such as Brown & Root Inc., Santa Fe Braun, Raymond International (all from the U.S.A.), Costain and Tarmac (from the U.K.), Philipp Holzmann AG (West Germany), Stevin and Boskalis (from the Netherlands) and Spie Batignolles (France).

Although ten companies were invited to the tender, some withdrew and others formed a consortia to tender for specific elements of the overall project (shore or sea works etc.). The tender results announced by the client, Saudi Ports Authority (SPA), were as follows: (1) Spie Batignolles offered a tender only for the shore construction works with a tender price of US 1,014M$; (2) Brown & Root Inc. submitted a tender only for the sea construction works with a tender price of about US 904M$; (3) Santa Fe Braun offered a tender price of about US 1,807M$ under the real cost adjustment system for the shore works and co-construction with Brown & Root Inc. for the offshore works; (4) Stevin, representing a consortia with four firms from the U.K. (Costain and Tarmac), West Germany (Philipp Holzmann AG) and the Netherlands (Boskalis), submitted a tender with a price of about US 1,520M$; and (5) Hyundai E&C offered a tender for both shore and sea works with a bid of about US 931M$, the lowest tender price.

Although, seemingly, Hyundai E&C was almost certain to receive the order, SPA prevaricated, in particular over Hyundai E&C's construction capability with regard to the Open Sea Tanker Terminal. To overcome this obstacle, Hyundai E&C took complementary measures to compensate for their lack of experience by entering into a technical agreement with Brown & Root, a specialist in offshore construction works.

An agreement was finally concluded with SPA on 16th June 1976. The contract term was for four and half years (from June 1976 to December 1980), including a one-year defect guarantee period. Sir William Halcrow & Partners of the U.K., a technical service company, took charge of the design and supervision of the project.

9.2.3 THE SUCCESS OF THE JUBAIL INDUSTRIAL HARBOUR WORKS

A BROAD VIEW

Project Functionality

The clients - SPA and the Saudi government expressed satisfaction with the technical quality of the work and with the level of costs.

Project Implementation

According to the traditional criteria, the Jubail Industrial Harbour was a project management success: final costs were within budget; the project was finished ten monthes earlier than the contract period; and technically the project turned out well. There was considerable attention given by Hyundai E&C to planning and control systems but insufficient to industrial relations and labour management.

Contractor's Commercial Performance

Hyundai E&C contributed to the reputation of the Korean industry and earned satisfactory profits in consequence of comprehensive and precise estimation and thorough planning, much against foreign firms' expectations that Hyundai E&C would suffer a loss.

DETAILED ANALYSIS

Objectives

The objective of the Industrial Harbour was clear - to create industrial facilities in the Jubail area, the eastern oil field of Saudi Arabia. There was also a clear management plan.

Technical Uncertainty

Technical uncertainty over the OSTT part of the Industrial Harbour project was real, but Hyundai E&C solved the problem by entering into a technical agreement with Brown & Root. Technical problems which remained were resolved by Hyundai E&C by the application of in-house appliances and a construction method with simple ideas: vis; (1) a mixer truck rebuilt, which could produce stabits[3] without a crane; (2) a lifting device, which could convey, load and unload blocks by the adjustment of a handle; (3) a platform for underwater survey, which was used for inspection of elevation and base line after establishing the blocks; (4) an adjustment appliance, used for adjustment of the surface, which allowed extremely small permissible error after the foundation riprap is dropped; and (5) a single method construction device[4], which was used for the installation of stabits.

Physical Challenges

Working at sea created some delays because of the technical problems of uplift pressure and strong wind. However, the utilisation of an above water platform for underwater survey and the "single" construction method were very effective for minimising delay.

The steel frames used on this project were all manufactured in Korea and transported by ship to Jubail. This reduced on-site labour requirements and made it easier to obtain the technical quality required.

Political, Social and Other "External" Factors

Hyundai E&C had had an agency contract with Prince Nawaf of Saudi Arabia prior to submission of the tender for the Industrial Harbour. Although he gave no direct assistance to Hyundai's Industrial Harbour tender, nevertheless, he requested an agent's fee and was finally paid 2.0% (US 18M$) of the contract price. Apart from this, the Industrial Harbour Project had been free of political "interference".

Urgent Schedules

The contractor, Hyundai E&C, was able to complete the construction works ten months ahead of schedule, a testimony to the persistence and faith of both the employer and employees. In addition, the application of the platform appliance for underwater survey and the "single" construction method contributed to a shortening of the construction phase.

Contract Terms

At that time of the contract, an access road to the work site was too narrow. The construction of a temporary quay for cargo work involving all sorts of resources and equipment was inevitable, but Hyundai E&C bore the construction expenses of the quay.

Organisation Structure

The Hyundai E&C's strong project oriented organisation was advantageous, and an efficient support system embracing technology, equipment, resources and manpower, created by the setting up a separate support department for the Middle-East, and the use of special task forces on several occasions, proved successful.

Leadership

The personality and leadership of the project manager was very important in the early stages of the project at a time when there were still uncertainties as to how to tackle such a project. The leadership demonstrated by senior managers was strong, being particularly evident in the early period of project team building. However, the leadership demonstrated by senior managers on site was unsatisfactory in its handling of industrial relations issues.

Labour Relations

Labour militancy (unrest) had a direct and dramatic impact on the conduct of the project. Given the project's location (the Middle-East), this should have been foreseen and efforts made to be more sensitive to pay and working conditions.

Communications

Effective communications with the workforce were also deficient. However, labour management was actively improved during the contract period and a joint industrial council contributed to an improvement in labour relations.

OVERALL SUMMARY

The Jubail Industrial Harbour works is an impressive and, in many ways, a beautiful piece of engineering. The question at issue is only whether industrial relations problems could have been handled better.

The successful accomplishment of the Industrial Harbour has a number of benefits. In consequence of finishing such a large and complex civil engineering project, including all kinds of engineering works, on land and offshore, Hyundai E&C not only gained an entry to new technologies but also laid a foundation for continuous overseas construction exports by Korean firms. In particular, with the accumulation of construction experience in a totally unknown field to Korean firms, Hyundai E&C provided a momentum for Korean construction export companies to make advances into the offshore construction markets which had been monopolised in the past by developed country firms. For example, no sooner had Hyundai E&C finished the Industrial Harbour than it succeeded with a contract to undertake the Yanbu Package IV Gas Line project (liquefied gas terminal offshore works) in Saudi Arabia.

9.3 SM-CF CEMENT FACTORY CONSTRUCTION, IRAQ*

9.3.1 INTRODUCTION

The SM-CF Factory Construction Work was an order, implemented by the Ministry of Light Industry (MOLI) of Iraq, to supply a construction site and factory for the production of cement.

A prime contractor of this construction work was KHD HUMBOLDT WEDAG AG of West Germany. LIH of Korea, as a sub-contractor, was involved in various construction and civil engineering projects for the construction of the SM-CF Factory, which has a capacity to produce two million tons of cement per annum. The construction site is located near Samawa, 271 km south of Baghdad (see Figure 9.1). The firms which participated in the SM-CF work are shown in Figure 9.2.

9.3.2 THE BACKGROUND

LIH had successfully constructed an engineering works in Yanbu (Saudi Arabia) in 1980 as a sub-contractor of KHD, the prime contractor of the SM-CF construction.

On 25th March 1981, KHD requested that LIH also take part as a sub-contractor in the engineering and construction works of the SM-CF factory construction, for which KHD had received an order. Accordingly, LIH estimated the potential profitability of the SM-CF works on the basis of its previous construction experiences with KHD in a similar construction project and decided to participate in the SM-CF project.

On 30th July 1981, LIH entered into a contract with KHD concerning the engneering and construction works, excluding the steel frame works which had already been installed by INDUMENT, a subsidiary of KHD. The contract amount and construction period was for US 35.60M$ and twenty three and half months (from 30th July 1981 to 14th July 1983), respectively, under a lump sum agreement*.

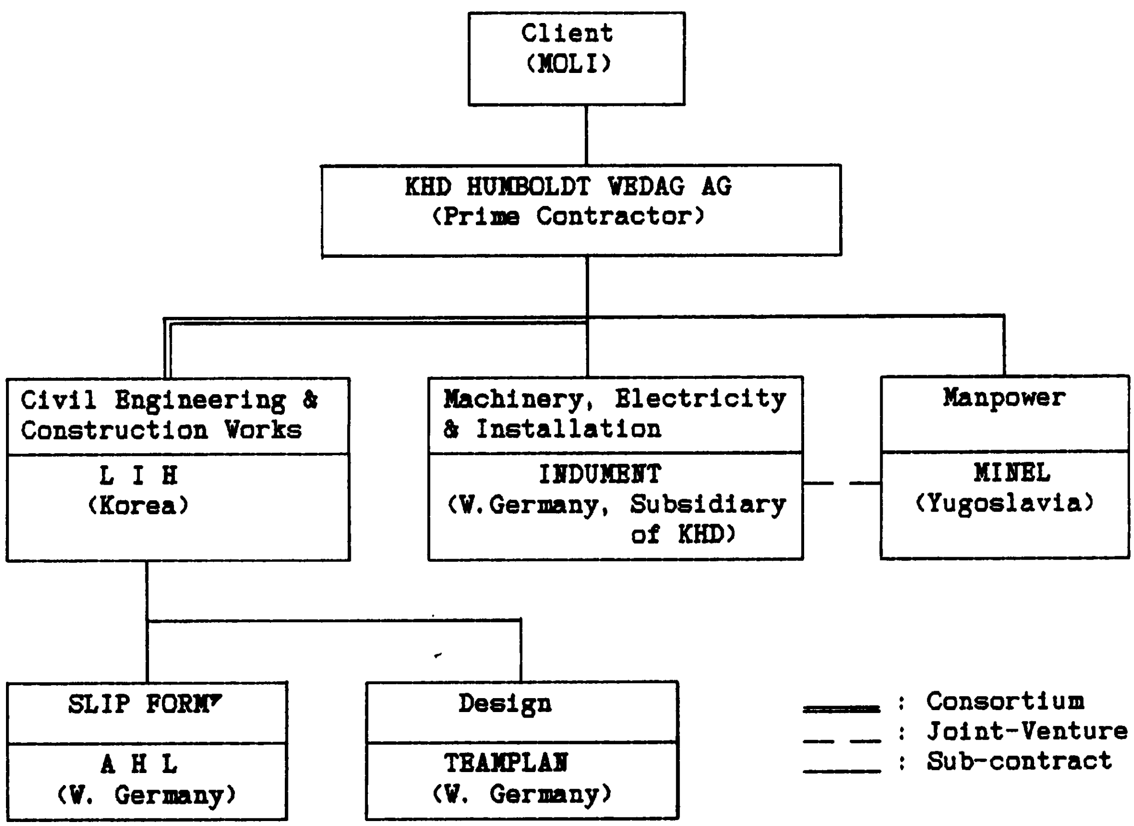
Figure 9.1

The Construction Site and the Location of Construction Materials

LIH sublet the slip form construction work, the production line design and KHD camp construction work, including various subsidiary facilities, to the West German firms AHL, TEAMPLAN and STREIF AG, with contracts equivalent to US 1.03M$, US 0.80M$ and US 2.40M$, respectively (see Figure 9.2).

Figure 9.2

Participants in the SM-CF Factory Construction Project.



During the construction, LIH entered into an additional contract with KHD amounting to US 4.8M$, arising from a 25% increase in materials for construction in excess of the Bill of Quantities (BQ).

A fire of unknown origin in August 1982 at the completed pre-heater installation contributed US 2M$ to overall losses. But LIH finished the restoration work over a five-month period and received a prolongation with regard to the construction works by four and half months. The whole construction works was completed on 30th November 1983.

9.3.3 THE SUCCESS (AND FAILURE) OF THE SM-CF FACTORY CONSTRUCTION WORK

A BROAD VIEW

Project Functionality

The clients, MOLI and the Iraqi government were satisfied with the cement factory, which was completed within the time scale and to cost.

Project Implementation

Since LIH committed the same management and workforce to the SM-CF project that had worked on the similar construction work in Saud Arabia, the company demonstrated a professional competence in this type of construction management.

LIH was able to divert appropriable and available equipment from the Saudi project to Iraq, instead of buying new equipment. In effect, a profit of US 3.95M$ was attributed to the efficient management of equipment.

To maximise profits LIH operated a work charge system* with respect to the staff and an efficiency wage system toward the skilled mechanics.

To compare the composition of construction costs associated with the SM-CF project, the Overseas Construction Association of Korea compared the composition ratio of the SM-CF construction with that of three other constructions, which were similar with respect to type, size and duration. The respective ratios are shown in Table 9.1.

Labour and material costs of the SM-CF construction were greater than those of the three comparable projects due to an increase in the amount of materials required for construction. Equipment costs of the SM-CF construction were also higher because this was LIH's first contract in Iraq. But the management expenses were reduced in consequence of efficient construction management.

TABLE 9.1

A COMPARISON OF CONSTRUCTION COMPOSITION RATIOS

Unit: %

Costs of Construction	Average Composition Ratio of Three Similar Constructions	Composition Ratio of the SM-CF Work
Labour Cost	17.9	19.0
Equipment Cost	5.6	15.1
Material Cost	45.0	45.8
Management Expenses	31.5	20.1
Total	100.0	100.0

Contractor's Commercial Performance

LIH suffered a partial long-term payment delay from the client concerning the completed work. However, rather than borrow and incur interest charges, LIH diverted cash flow from other construction sites to meet financial needs at the SM-CF construction site.

Table 9.2 shows the estimation of various profit and loss elements in the overall contract.

It can be seen that if LIH was to receive the sum of money outstanding on completed construction from the Iraqi government (about

US 6.63 M$) and fire compensation from the Iraqi National Insurance Company (US 1.8M$), the SM-CF construction would have generated profits of about US 2.50MS; otherwise, LIH suffers a loss of about US 5.94M$.

TABLE 9.2

PROFIT AND LOSS ELEMENTS IN THE SM-CF PROJECT

Unit: US 1,000$, %

Elements	Ratio(%)		Amount		Balance
	Profit	Loss	Profit	Loss	
1. Efficient commitment and diversion of equipment	9.68		3,950.0		
2. Proper sub-contracting	2.36		964.8		
3. Employment of workers from third countries	0.22		91.3		
4. Unit cost increases arising from materials purchase		3.23		1,317.9	
5. Increase of manpower commitment		2.93		1,197.2	
6. Outstanding fees due on completed work		16.25		6,629.2	
7. Outstanding amount due on fire insurance money		4.40		1,800.0	
Total	12.26	26.81	5,006.1	10,944.3	5,938.2 (Loss)

Source: A Profit and Loss Analysis Report on Overseas Construction (1984), supplement on the Profit and Loss Case Analyses on Overseas Construction (Overseas Construction Association of Korea), June 1984, pp. 379.

DETAILED ANALYSIS

Objectives

The objective of the SM-CF construction was to supply cement required for Iraqi economic development. There was also a clear management plan.

Technical Uncertainty

A lack of technical expertise in slip form construction work and production line design was resolved by sub-contracting these projects to AHL and TEAMPLAN, respectively (see Figure 9.2).

Political, Social, Environmental and Other "External" Factors

The morale of the skilled mechanics was low during the whole construction period due to the Iraq-Iran War. Iraq had mobilised most of the available manpower for the war effort. Accordingly, the supply of expert personnel required for administrative management was insufficient. For example, administrative delays in obtaining clearance and approval to proceed with construction work at various stages had a detrimental effect upon the smooth progress of the overall project and contributed to high costs, and the Iraq-Iran War gave rise to supply bottlenecks and disruptions.

Meeting Contract Dates

LIH was unable to complete the SM-CF construction within the agreed construction period. Some of the reasons for this are as follows:

LIH failed to make a thorough survey of the SM-CF construction site. Thus, the actual amount of materials required for construction increased by about 25.0% more than that on the bill of quantities and delayed the work schedules.

Schedules were delayed by a fire (see above).

LIH presented a design drawing of the lower part structure to the prime contractor (KHD) on 10th April 1982, but KHD delayed its submission to the client because of a design change to the upper part structure by KHD. In consequence, LIH was late in getting the client's approval with regard to the cement production line design. This delayed the construction period by four months.

Contract Terms

Although LIH actually took part in the SM-CF construction as a sub-contractor of KHD (prime contractor), it entered externally into a consortium contract with KHD under which LIH was jointly responsible for risks, including penalties and deferred payment in the event of late completion.

According to the contract, LIH had to bear the cost of increases in the amount of materials used in construction up to 15.0% of the contract amount. The contract contents restricted the compensation to a maximum of US 6.80M$, irrespective of the quantity of additional materials required over 15.0%. Thus, the contract contained enough room for dispute which, should it occur, was to be reconciled by the German Federal Republic Arbitration Committee, where some bias towards KHD might have been anticipated.

Human Relations

Representatives of each of the large number of sub-contractors were summoned to weekly progress meetings where potential problems were discussed.

Labour Relations

There were no significant direct labour relations problems during the contract.

OVERALL SUMMARY

Despite unfavourable circumstances, such as the fire, the new market environment and contractual problems with the prime contractor, LIH's SM-CF construction would be judged a financial success if outstanding fees and fire compensation were to be paid.

The success factors can be summarised as follows: (1) efficient operation of equipment; (2) efficient construction management (e.g. the work charge system and efficiency wage system); (3) the efficiency of the sub-contractors (e.g. for the slip form construction work and the production line design); and (4) the positive support from head office and branch offices of LIH with respect to materials, equipment and funds etc.

The SM-CF construction experienced several important profit and loss factors which other Korean overseas construction companies had also experienced in foreign countries. However, the SM-CF construction demonstrated a) the importance of detailed and accurate cost estimates and analysis of materials required and b) the importance of maintaining close and effective working relationships with the client and prime contractor.

9.4 AK-PH(1) HOUSING CONSTRUCTION, SAUDI ARABIA*

9.4.1 INTRODUCTION

The AK-PH(1) Housing Construction was placed on order by the Ministry of Public Housing (MOPH) of Saudi Arabia, which launched a large-scale housing construction project in three areas, namely, Riyadh (the central area), Jeddah (the western area) and Al-Khobar (the eastern area). The AK-PH(1) relates to the central construction in Riyadh.

A prime contractor of the AK-PH(1) Housing Construction was a HH led Consortium of four Korean construction companies, HH, SH, HS, and JH[10]. SH and JH took charge of the construction work, with SH responsible for civil engineering and construction and JH for external electricity and communication construction. The scale of the AK-PH(1) Housing Construction related to 864 separate houses and 60 apartment buildings to accommodate 2,166 households. The construction site was located 17 km south-east of Riyadh City (see Figure 9.3). The participating firms in the AK-PH(1) project are shown in Figure 9.4.

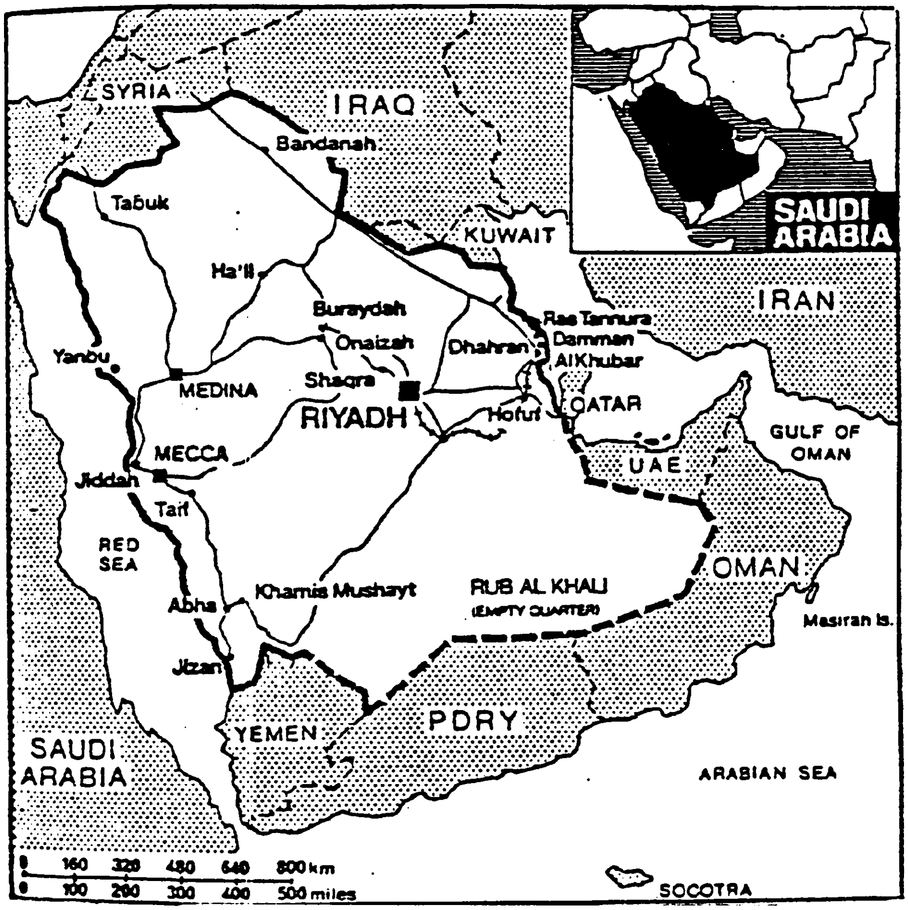
9.4.2 THE BACKGROUND TO THE AK-PH(1) CONSTRUCTION PROJECT

Having projected the large-scaled housing construction scheme, the Public Housing Minister of Saudi Arabia visited Korea in August 1977 and requested the Korean Ministry of Construction to advise of Korean construction companies capable of undertaking the project.

By the recommendation of the Ministry of Construction, HH received an invitation to tender for the central area (the first, second and

Figure 9.3

The Construction Site of the AK-PH(1) Housing Construction



fourth zones in Riyadh) from the client in October 1977. HH set up a consortium with SH, HS and JH.

Background to the Tender and the Contract

The HH Consortium drew up a tender which incorporated a design plan through to the turn-key stage. However, the Building Construction Group (BCG), a Saudi Pre-cast Concrete (P.C.) production firm, gave the design services contract to KOBER, a U.S. construction design service firm, and to GODE, a Swiss electricity and installation design service firm. BCG proposed that its designs should be adopted by the HH Consortium in its tender proposal which, if successful, should sublet the PC supply to BCG.

The HH Consortium judged that the design plan supplied by BCG would be more attractive to the client than that drawn up by itself. Without making a thorough investigation of the design prepared by BCG, HH Consortium offered a tender document on the basis of this design on 14th February 1978. The HH Consortium design proposal was accepted for the first and the second of the three construction zones in the Riyadh Housing Construction project, and a contract agreement was concluded on 28th May 1978.

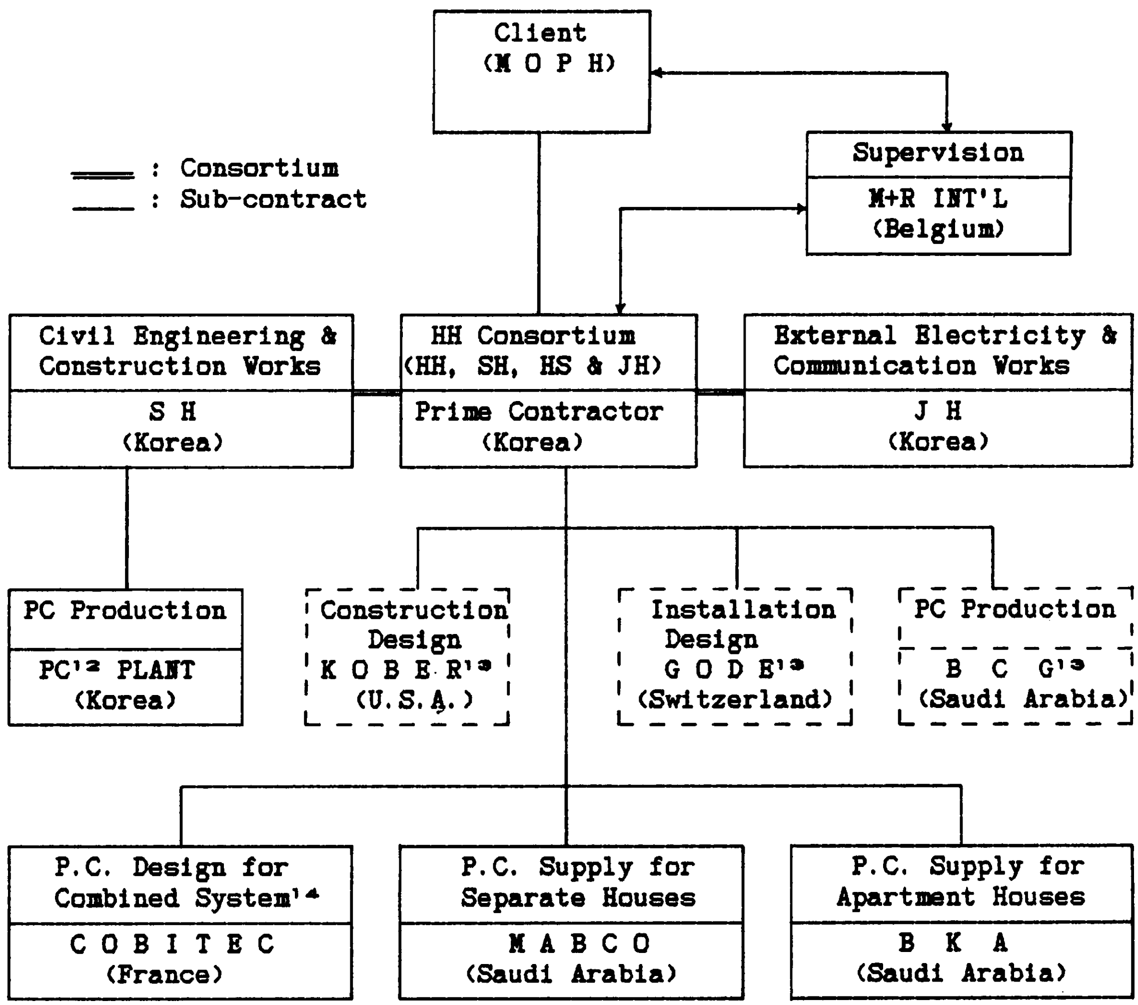
The Construction Phase

The HH Consortium came to an agreement to take over a portion of the construction works. Thus, SH and HS took charge of the first and the second zone construction, respectively, and JH took charge of the external electricity construction in both these zones.

In August 1978, in accordance with a promise to BCG at the time of tender, the HH Consortium concluded a supply contract for BCG to supply the pre-cast concrete required for the first and the second zone construction. However, the Consortium, judging that BCG was unlikely to deliver on time due to financial difficulties and technological constraints, cancelled the contract with BCG in May 1979. The HH Consortium solved structural problems associated with the pre-cast concrete requirements in the apartment buildings and reduced steeply the quantity required by a design change to a mixture of pre-cast concrete and Rahmen''.

Figure 9.4

Participating Firms in the AK-PH(1) Housing Construction Project



After the contract cancellation with BCG, the Consortium sublet pre-cast concrete supplies on-the-spot to Prefabricated Building Co. (MABCO) and Betonbah Koch Arabia (BKA) (see Figure 9.4). However, supplies were further delayed due to the limited production capability of MABCO and

BKA. In response SH internalised supplies by the expediency of building a PC plant, but a lack of experience and technology with respect to the PC construction method continued to delay supplies.

After completion of the housing framework, at the finishing stage, water leakages affected 25.0% of the individual houses and 62.0% of the apartment buildings in February 1982 (the rainy season) due to lack of a water-proofing of the PC structures. Repairs to construction and utilities delayed the completion date by about two and a half years.

The client (MOPH) invoked a delay penalty equivalent to 10.0% of the value of the contract, but the Consortium judged that some of the delay could be attributed to the client (such as delays in appointing supervisors and obtaining bloc visas from the Saudi government, design changes etc.). Accordingly, HH sought a review and extension of the construction period.

9.4.3 THE FAILURE OF THE AK-PH(1) HOUSING CONSTRUCTION WORK

Table 9.3 summarises the factors which had an important bearing upon the failure of the project with respect to completion dates, quality of work and costs.

A BROAD VIEW

Project Functionality

The clients, MOPH and the Saudi government, expressed dissatisfaction with the construction delay and with the technical quality of the work. The contractor, HH Consortium, expressed dissatisfaction with the over-run on costs. The project was undoubtedly a major failure.

Project Implementation

According to the traditional criteria, the AK-PH(1) Housing Construction can be deemed a failure in project management. Final costs were 25.6% above the original contract amount; the project took almost twice as long to construct as was planned; and there were technical weaknesses.

The project management failure was associated with the lack of planning and the application of techniques, such as Critical Path Analysis (CPA), to anticipate and react to problems and bottlenecks inevitable to occur on such a large housing project (see Table 9.3).

Contractor's Commercial Performance

The HH Consortium's performance discredited the Korean construction industry which gained a reputation for a lack of a) technology and experience, b) process and quality control abilities, c) sophisticated contract and claim assessment skills, d) consortium management skills, e) fund raising competence, f) manpower planning, and g) an inability to temper the competitive rivalry between Korean construction companies.

According to the Profit and Loss Analysis Report of Overseas Construction(1984) published by the Overseas Constuction Association of Korea, the HH Consortium suffered a loss of about US 150M$ (518MSR), accounting for 33.0% of the contract amount, in the AK-PH(1) Housing Construction. Table 9.4 gives a break-down of this.

TABLE 9.3

A SUMMARY OF FAILURE FACTORS IN THE AK-PH(1) HOUSING CONSTRUCTION

Phase	Factors	Construction		
		Back-ground	Cost	Period
Tender & Contract	• Lack of engineering ability of Turn-Key Base construction	X		
	• Lack of investigation into on-the-scene eventualities	X		
	• Lack of negotiation skills in support of a tender		X	
Construction Plan	• Inability to plan and monitor work in progress	X		
	• Non-existence of a scientific process control system	X		
	• Lack of advance preparation on special construction methods	X		
	• Lack of skilled technical manpower & organisational weaknesses in the field	X		
Construction Start	• Delay in gaining approval of design drawings			X
	• Delay in appointing supervisor			X
	• Delay in issuing a bloc visa			X
Constrution Mgt	• Lack of process control skills	X		
	• Recurrent disputes with sub-contractors (BCG, KOBER/GODE)		X	X
	• Change of P.C. supply source and delays in P.C. supply		X	
	• A ban on the use of a specific explosive			X
	• Occurrence of surplus materials		X	
	• Delay in gaining customs clearance and			X

Phase	Factors	Construction		
		Back-ground	Cost	Period
	government approval for imported materials			
	• Additional equipment and manpower costs		X	
	• Change in the design & construction method on the apartment frame construction		X	X
	• Lack of technology on use of Shuttering Form			X
Construction Mgt	• Defects during construction		X	X
	• Design change on external electricity work		X	
	• Construction interruption on 15 apartment buildings			X
	• Unreasonable demands of client & supervisor		X	X
	• Frequent replacement of the head of costings	X		
Fund raising and employment	• Delay of receipt on completed works		X	
	• Impractical use of advance receipts		X	
External Factors of Construction	• A dual supervision system	X		
	• Over-strict supervision by construction supervisor	X		
	• Difficulty in integrating construction firms due to different construction supervisors by zone	X		
	• A lack of common systems within the consortium	X		
	• A lack of co-operation between member firms of the consortium	X		
	• Weak Co-ordination Committee	X		
	• Acceptance of unfavourable conditions of contract with the client	X		
	• Unpreparedness of data for claim	X		

DETAILED ANALYSIS

Objectives

The objectives of the Housing Construction was clear - to supply the housing facilities in Riyadh, the capital of Saudi Arabia.

Technical Uncertainty

Technical uncertainty over PC requirements was real, but the HH Consortium found it difficult to erect a PC plant due to a lack of technology and experience in the PC construction method. The HH Consortium had to employ foreign technicians and commit additional shuttering forms (a sheeting) to framework due to a lack of technological know-how. This resulted in additional expenses and delays to the frame construction of the apartment buildings.

Urgent Schedules

Construction delays induced pressures to rush work through to recover lost ground. This in turn had adverse effects on the quality and precision of the workmanship and on relationships between member companies of the Consortium, which added to costs and led to further delays (see Table 9.3).

Contract Strategy, Terms and Conditions

Among the unfavourable conditions of contract accepted by the Consortium were an absence of compensation for price escalation on items beyond the control of the Consortium and the need to submit disputes for conciliation to the Saudi Board of Grievance. The price compensation was, to some extent, foreseen and discounted in the original estimates. But problems with dispute procedures were overlooked so that appropriate institutional arrangements to negotiate disputes were not in place.

The dispute with BCG might be attributed to the Consortium's failure to investigate BCG's ability and substance. Nevertheless, there was no machinery to deal with disputes without resorting to formal conciliation, for example by an agreement to cancel contracts on supplies which were subject to late delivery.

Additional requests for further specifications or items (i.e. street lighting, not specified in the contract) were met by the Consortium, but the client refused to meet the costs arising from this work.

Political, Social, Environmental and Other "External" Factors

Work on site was delayed for three months due to a complicated process of bloc visa arrangements via the Saudi government and to the inexperience of the Korean firms on issuing procedures. A ban on the use of a specified explosive led to a three months delay in the production of framework material for the PC plant.

The HH Consortium was unable to make direct contact with the client because of a dual supervision system (see Figure 9.4) which frustrated the progress of construction. This was further exacerbated by overzealous supervision by the construction supervisor as compared with AK-PH(2), the second zone project, where construction conditions were the same as those of AK-PH(1). Besides, it was difficult for construction firms to unify their actions on account of the use of different construction supervisors for each zone.

TABLE 9.4

ITEMISATION OF LOSSES ON THE AK-PH(1) HOUSING PROJECT

Unit: 1,000 Saudi Riyal, %

Factors	Amount	%
∘ Penalty for delay in construction	175,952	34.0
∘ Increase in cost of materials for construction	19,796	3.8
∘ Disputes with sub-contractors	72,819	14.1
∘ Additional equipment and manpower costs	74,799	14.4
∘ A change of design and construction method on the apartment frame construction works	79,609	15.4
∘ Lack of technology on use of Shuttering Form	8,201	1.6
∘ Defects under construction	49,913	9.6
∘ Surplus materials	10,300	2.0
∘ Delay in payment on completion	9,474	1.8
∘ Interest foregone on money collected in advance from the client	21,775	4.2
∘ Poor quality and repair identified by inspectors	38,953	7.5
∘ Others (interruptions, late approvals etc.)	39,224	7.6
∘ Lower unit costs of construction (<u>profit</u>)	△81,116	△15.7
∘ Design change economising on material (<u>profit</u>)	△ 1,529	△ 0.3
<u>Total Loss</u>	518,168	100.0

Source: <u>The Profit and Loss Analysis Report of Overseas Construction</u> (1984), supplement on the Profit and Loss Case Analysis of Overseas Construction (the Overseas Construction Association of Korea), June 1984, pp. 172.

The HH Consortium failed to prepare claim data[15] in time when claiming costs arising from construction delays which could be attributed to the client (see Table 9.3). As a result, the HH Consortium was not properly compensated by the client.

Co-ordination and Co-operation

Adequate co-ordination and co-operation is especially important when a large number of companies contribute to a project. In the case of the AK-PH(1), with four companies in the HH Consortium, co-ordination and co-operation of the project was unsatisfactory.

Since the contract with the client in both the first and the second zone was under the HH Consortium name, the Consortium was in a position to pursue a common strategy in their relationships and negotiations with the client. However, such unity was lacking because individual members of the Consortium pursued separate priorities and objectives to the detriment of overall profitability. Accordingly, the HH Consortium was unable to fully integrate the management of the two zones and this was unfavourable to all member firms of the Consortium.

Because of wide price differences in the tenders of the respective Korean construction firms, the HH Consortium suffered a considerable price reduction in the process of negotiating the AK-PH(1) construction project. Thus, the Consortium's tender price was about 1,906MSR, but its contract price was reduced to about 1,571MSR, a dramatic reduction (17.6% of tender price), which could be attributed to competitive bidding between rival Korean firms.

Change in Specification

There were substantial design changes throughout the duration of the project. For example, the HH Consortium, in solving the structural problems related to the PC for the apartment buildings, changed to a design incorporating a mixed structure of PC and Rahmen (Combined System), and in doing so bore the additional expenses (about 14MSR) and suffered a delay in construction of eight months.

The client extensively changed the design of the electric power supply system, which caused the JH firm to delay external electricity work for about one and a half years. This had a considerable influence on the progress of the civil engineering and construction work undertaken by SH.

Organisation Structure

A Co-ordination Committee was established to settle the joint problems among the construction firms of the first and the second zone in which HH, as sponsor contractor, provided the leadership. However, the committee could not perform its original function smoothly on account of a lack confidence in the Consortia and a failure to understand its role.

The technical and language skills of some of the skilled technical manpower employed in the first stage were found to be deficient and had to be supplemented by a large element of additional, external manpower which impeded further the rate of progress.

Leadership

The head of construction in the field was replaced on four occasions during the six year construction period. The HH Consortium could not classify clearly where the responsibility on cost control lay and relied on comparisons between a periodic operating budget and actual invested expenses.

Labour Relations

There were no significant direct labour relations problems.

OVERALL SUMMARY

The AK-PH(1) Housing Construction can be regarded as a failed project. There are two questions that remain to be answered in evaluating the failure of the project. Should it have taken so long for construction to get underway? Should the cost and duration of the construction have been so much greater than initially budgeted?

The problem which arose concerning the supply of PC, directly and indirectly, created most of the serious elements of failure, namely delays in work in progress, hasty and sub-standard work to recover lost ground, and additional costs associated with unforeseen equipment and manpower shortages.

Within the consortium the inability to solve these problems satisfactorily can be attributed to a lack of experience and technological knowledge, an absence of process and quality control and weak administration and management (e.g. with respect to contracts and claims procedures and negotiation skills, the incompetent control of funds and manpower, and internecine competition between the members of the consortium).

9.5 CONCLUSION

In this section various lessons are drawn on the preconditions of success and failure to emerge from the case histories. In the first case history, factors in the success of a tender for plant exports were reviewed. The remaining cases identified the factors considered to be preconditions of project success or failure. The lessons from each of the case histories are as follows:

Bombay Offshore Oil Production

- Reputation (e.g. meeting delivery date and product quality) and past record played a decisive role in winning the bid.
- Continuous contact and negotiation with the client, the Indian government, played an important role. Although Hyundai Heavy Industries Ltd. (HHI) was the second lowest bidder in the IABCD re-tender, HHI communicated and negotiated continuously with the client, explaining the firm's advantages, such as its past construction experience with the client and its accumulated technology.
- The above two factors, as shown in Table 8.27, were also considered to be important by both Korean plant and construction firms and other international firms.

Jubail Industrial Harbour

- Top management support, consistent and effective senior management leadership and a thorough initial study were all decisive success factors.
- The use of an established design which was then inviolate, clear project organisation, and prompt and helpful project control were important.

- In situations of technical uncertainty and complexity, the application of new appliances and simple construction methods can contribute to savings against the projected budget and to a shortening of the construction period.
- A disciplined approach to industrial relations must be exercised from the outset.

SM-CF Factory Construction

- There should be a thorough survey of the construction site.
- The success of the SM-CF was due to several factors but management commitment must be counted above all others.
- Assess all risks adequately: budget validity, political risk (the Iraq -Iran War), etc.
- The initial design, once agreed with the client, should be inviolate, except for unforeseen circumstances.
- Organisational confidence, strong leadership and effective communications make a significant contribution towards success.
- International projects, when well managed, are neither more complex nor more difficult than national ones.

AK-PH(1) Housing Construction

- Designs should be appropriately developed and adequately tested before making a commitment to full-scale production (P.C. design).
- Avoid, if possible, a commitment to go-ahead with a project if the technology and design is in a preliminary or untested state.
- Avoid concurrency[15] if possible. Design changes after production has begun is sometimes essential for commercial or other reasons, but must

be undertaken with caution and under strict management control.

- Once a design is agreed it should be inviolate, except with the explicit recognition that there may be major cost increases as a consequence.
- There may be extreme dangers in switching the design authority (e.g. from KOBER to COBITEC) during different phases of a development.
- Inadequate design (PC design in the apartment buildings) and project management procedures will lead to confusion and inefficiency.
- There should be a thorough appraisal of the sub-contractors' technical and managerial abilities (in particular, the Building Construction Group).
- Where a careful pre-commitment appraisal (through pre-feasibility, feasibility and design studies) with respect to major technological projects is not possible, budget projections must be recognised as uncertain and, therefore, should be targeted within a range of estimates rather than be set at a single figure. The client is then more likely to accept the possibility of initial budget overruns. Contractors must secure reimbursable contracts on the best possible terms, and manage their claims process professionally.
- It may sometimes be advantageous to change contract terms during the life of a contract.
- Fixed price contracting is clearly inappropriate in high risk situations. Where the risk is high, provision for cost recovery must be allowed.

Preconditions of Success.

1. All projects require consistent government support;

2. Technology and design management is important in all projects where technology or design poses challenges;
3. Organisation and contracting strategy fundamentally influence the profitability of a project;
4. Leadership and effective communications are vitally important to effective construction implementation;
5. Industrial disputes tend to be "project specific" in the construction industry; and
6. Scheduling and financial arrangements require careful consideration, particularly in the planning stages.

Often, some of these preconditions will not be met on account of individual error, preference, company circumstances or institutional constraints. This study illustrates the basic features of good project management. It is expected that these case histories will serve as a guideline for plant and construction exports companies.

NOTES

1. The text of portions of this section is drawn from Hyundai Bulletin, January 1987, pp. 52-53.

2. The text of portions of this section is drawn from the Thirty Five Years' History (II) of Hyundai Engineering & Construction Co., Ltd., 30th May 1982, pp. 2136-2185.

3 A stabit, a cement structure, is used to weaken wave power.

4. This is a construction method by which a wire is automatically untied when a stabit is laid in a designated place. Thus, diver mobilisation is unnecessary.

5. The text of portions of this section is drawn from a Profit and Loss Analysis Report on Overseas Construction(1984), supplement on the Profit and Loss Case Analyses on Overseas Construction (Overseas Construction Association of Korea), June 1984, pp. 317-381.

6. Payment is based on prices or rates submitted by the contractor in his tender. These prices are deemed to include all costs, overheads, risk contingencies and profit (Perry, 1985, pp. 76).

7. A special equipment used for construction work. The prime mover of this equipment is a hydraulic jack. The advantages with SLIP FORM are as follows: reduction of construction period; saving of manpower and resources; and a small construction error.

8. LIH attributed the target attainment monthly, within the limits of the operating budget of the engineering work, toward each staff engineer's work-in-charge. In cases of successful completion, the results will be reflected in their performance ratings.

9 The text of portions of this section is drawn from a Profit and Loss Analysis Report of Overseas Construction(1984), supplement on the Profit and Loss Case Analysis of Overseas Construction (the Overseas Construction Association of Korea), June 1984, pp. 85-174.

10. The names of the firms in the Consortium have been withheld from the author on the grounds of confidentiality.

11. This is a construction method by which an edge is firmly made to resist the external force. Most of the frames of ferro-concrete buildings are made by this method.

12. P.C. stands for Precast Concrete.

13. Contracts were cancelled due to a dispute in the middle of the contract period.

14. This is a construction method by which concrete is manufactured on the spot.

15. According to the conditions of contract, in the case of requests for an extension of the construction period (e.g. construction interruption, design change etc.), the contractor was required to claim via the construction supervisor by letter within four weeks from the date of any interruption.

16. Concurrency is the practice of initiating some production activities prior to the completion of full-scale development.

CHAPTER 10

RISK MANAGEMENT AND CONTRACT STRATEGY IN PLANT AND CONSTRUCTION CONTRACTS

This chapter will present an empirical survey of risk management and contract strategy in plant and construction contracts, the theoretical concepts of which have already been explained in chapter 5.

Discriminant analysis is employed a) for the country comparisons between Korea and the eleven countries already identified in chapter 8 and b) for an industry comparison between plant exporters and construction firms. Thus, in total, four groups are compared to determine attitudinal differences.

Crosstabulation analysis is also employed to investigate sets of relationships a) among some discrete variables and b) between some variables of risk management and those of contract strategy.

Therefore, this chapter has four sections:

1. Risk management.
2. Contract strategy.
3. Relationship between the variables associated with risk management and contract strategy.
4. Summary and conclusions.

10.1 RISK MANAGEMENT

Compared with home based contracts, overseas contracts generally produce a more extensive range of risks which often have a greater impact and probability of occurrence. In this section, attitudinal differences a) between country groups (Korea and other countries) and b) between industry groups (plant and construction) are compared by means of a stepwise discriminant analysis of the stages of risk management, namely the identification of risk sources, analysis and response. Only the independent variables which explain, respectively, most of the differences between groups and the important factors ranked by the country groups will be presented. This section concludes with a discussion of the geographical regions in which the sixty-two plant and construction export firms in the sample from the various countries have experienced risks.

10.1.1 RISK IDENTIFICATION

The Types of Risk in Overseas Plant And Construction Contracts

Table 10.1 shows the variables which significantly discriminate between the two country groups from among five main risks which these two groups have experienced in overseas plant and construction contracts (from a usable sample of 42 Korean and 20 foreign firms).

The most significantly discriminated variable is V124 (logistical risk), followed by V121 (technical risk). The group means' of these two variables are as follows:

	Korea	11 others		Korea	11 others
V124	.381	2.200	V121	3.643	2.250

TABLE 10.1

DISCRIMINATED SUMMARY TABLE: COUNTRY GROUPS

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V124		1	.5687	.0000	Logistical risk
2	V121		2	.5157	.0000	Technical risk

Source: The output of SPSS (Discriminant Analysis) for question No.13.

The validity of the discriminant functions are appraised by four standard criteria as used in chapter 8: eigenvalues, as measures of total variance in the discriminating variables; canonical correlation coefficients, as indicators (discriminating power) of the association between the discriminating functions and the variables which define group membership; Wilk's lambda, as an inverse measure of the discriminating power of those variables which have not been removed by the discriminating function; and chi-squared, which can be derived from Wilk's lambda to provide an indication of statistical significance. These four standard criteria will be used throughout this chapter to verify the validity of the discriminant functions.

According to the output of SPSS Canonical Discriminant Functions (Discriminant Analysis) for question No.13, the eigenvalue, canonical correlation, Wilks lambda and significance are 0.939, 0.696, 0.516, and 0.0000, respectively. These figures indicate a strong discriminating power and significance level. Therefore, we can conclude that there is a significant difference in the respective country group centoids (between Korea and 11 other countries) at 0.0000 significance level.

The classification results as a method of evaluating the effectiveness of the classification functions indicate that 38 of 42 observations in group 1 (Korea) were correctly assigned to group 1, and 16 of 20 observations in group 2 (11 others) were correctly assigned to group 2. From a total of 62 observations, 54 (87.1%) were correctly classified. Thus, this classification function is highly effective.

Table 10.2 indicates the discriminating variables which significantly discriminate between the two industry group, namely 19 plant exporters and 24 construction firms, from among five main risks already used in country group analysis. As can be seen, three variables significantly discriminate between the two groups.

TABLE 10.2

DISCRIMINATED SUMMARY TABLE: INDUSTRY GROUPS

STEP	ACTION ENTERED	ACTION REMOVED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V122		1	.8543	.0115	Financial risk
2	V121		2	.7935	.0098	Technical risk
3	V125		3	.7659	.0145	Construction risk

Source: The output of SPSS (Discriminant Analysis) for question No.13.

The group means' of these three variables are as follows:

	Plant	Construction		Plant	Construction
V122	3.474	4.583	V121	3.684	2.917
V125	1.895	2.542			

The eigenvalue, canonical correlation, Wilks lambda and significance (obtained from the output of SPSS Canonical Discriminant Function) are 0.306, 0.484, 0.766 and 0.0145, respectively. Therefore, we can conclude that there is a significant difference in group centroids (plant and construction) at 0.0145 significance level. However, the discriminant function is less valid than the country group model on the evidence of the eigenvalue and canonical correlation which are not large and the selected three discriminant variables which have a weak discriminant power.

The results show that from a total of 43 observations, 32 (74.42%) were correctly classified, indicating that this classification function is moderately effective.

As shown in Table 10.3, both plant and construction companies from both country groups regard financial risk as the most frequently experienced risk in overseas plant and construction contracts. This factor is the top ranked in both groups, with a mean score > 3.976. In addition, Korean companies also regard technical risk as a frequently experienced risk with a mean score of 3.643. This may be attributable to the low technological level in Korean firms compared with that of competitors.

Both country groups consider logistical risk to be the least frequently experienced risk (with mean score of 0.381 and 2.200, respectively), but Korean firms appear to have experienced fewer logistical risks than other firms. Observe that the technical risk and logistical risk variables in the country group comparison have a strong discriminating power.

TABLE 10.3

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO RISKS EXPERIENCED IN OVERSEAS PLANT AND CONSTRUCTION CONTRACTS

Variable Number	Factors	Weighted Mean Score: Korea (a)	Weighted Mean Score: 11 Other Countries (b)
* V121	Technical risk	3.643(2)	2.250(4)
V122	Financial risk	3.976(1)	4.150(1)
V123	Political risk	2.381(3)	2.850(2)
* V124	Logistical risk	0.381(5)	2.200(5)
V125	Construction risk	2.214(4)	2.850(2)

Source: Calculated from the output of SPSS (Discriminant Analysis Program) for question No. 13. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: from 5 (the most frequent) to 1 (the least frequent).

Note: 1. * represents significantly discriminated variables.

2. (a) 42 companies (b) 20 companies, 11 countries.

3. Figures in brackets indicate ranking according to frequency experienced.

<u>Technical Risk</u>

In Table 10.4, four variables of technical risk effectively discriminate between the two country groups, each of which has experienced technical risk in overseas plant and construction contracts.

The most significantly discriminated variable is V129 (advanced and new technology), followed by V127 (inadequate site investigation). The least significantly discriminated variables are V128 (uncertainty over the source and availability of materials), and V130 (need for standardisation of suppliers).

TABLE 10.4

DISCRIMINATED SUMMARY TABLE: COUNTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V129	1	.9018	.0131	Advanced and new technology
2	V127	2	.8353	.0049	Inadequate site investigation
3	V130	3	.7787	.0022	Need for standardisation of suppliers
4	V128	4	.7648	.0037	Uncertainty over the source and availability of materials

Source: The output of SPSS (Discriminant Analysis) for question No. 14.

The group means[2] of these four variables are as follows:

	Korea	11 others		Korea	11 others
V129	2.000	0.850	V127	2.262	3.500
V128	1.952	2.200	V130	1.857	1.000

According to the output of SPSS Canonical Discriminant Functions for question No. 14, the eigenvalue, canonical correlation, Wilks lambda and significance are 0.308, 0.485, 0.765 and 0.0037, respectively. The selected four variables have a moderate discriminant power and there is a significant difference in country group centroids at 0.0037 significance level. Thus, the discriminant function is moderately effective.

The classification function is moderately effective, with 44 (70.97%) from a total of 62 observations being correctly classified.

The discriminant analysis results of the industry groups concerning technical risk are not discussed here because the selected three discriminant variables, namely V126 (incomplete design), V127 and V128 have a very weak discriminant power and significance level is over 0.05.

In Table 10.5, firms from both country groups regard V126 and V127 as the two most important sources of technical risk (with a mean score > 2.26) among those which they have experienced in overseas plant and construction contracts. However, Korean firms rank technological factors (incomplete design and advanced and new technology) higher than do their competitors. This perception reflects the relatively low technological level in Korean firms. Accordingly, an increase of technological competence over time in Korean plant and construction firms should reduce the frequencies of technical risk which they will experience in the future.

TABLE 10.5

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO TECHNICAL RISK EXPERIENCED IN OVERSEAS PLANT AND CONSTRUCTION CONTRACTS

Variable Number	Factors	Weighted Mean Score	
		Korea (a)	11 Other Countries(b)
V126	Incomplete design	2.690(1)	2.700(2)
* V127	Inadequate site investigation	2.262(2)	3.500(1)
* V128	Uncertainty over the source and availability of materials	1.952(4)	2.200(3)
* V129	Advanced and new technology	2.000(3)	0.850(5)
* V130	Need for standardisation of suppliers	1.857(5)	1.000(4)

Source: See Table 10.4. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: from 5 (the most important) to 1 (the least important).

Note: 1. * represents significantly discriminated variables.
2. (a) 42 companies (b) 20 companies, 11 countries.
3. Figures in brackets indicate ranking according to importance.

The table also shows that non-Korean firms regard inadequate site investigation as the most important factor and advanced and new technology as the least important factor of technical risk.

Financial Risk

Table 10.6 shows that five variables of financial risk effectively discriminate between the two country groups, the most significantly discriminated variable being V133, followed by V138 and the least being V136 and V135. The group means[3] of these four variables are as follows:

	Korea	11 others		Korea	11 others
V133	1.833	3.800	V138	2.714	1.550
V136	1.619	2.750	V135	5.143	5.750

TABLE 10.6

DISCRIMINATED SUMMARY TABLE: COUNTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V133	1	.8428	.0014	Availability of foreign exchange
2	V138	2	.7595	.0003	Creditworthiness of contractors
3	V132	3	.7046	.0001	Inflation
4	V135	4	.6817	.0002	Delay in payment
5	V136	5	.6695	.0003	Repatriation of funds (profit)

Source: The output of SPSS (Discriminant Analysis) for question No. 15.

The eigenvalue, canonical correlation, Wilks lambda and significance (the four standard criteria to verify the validity of discriminant functions) are 0.494, 0.575, 0.669 and 0.0003, respectively. These figures show that the selected five variables have a moderate discriminant power and there is a significant difference in the respective country group centroids at 0.0003 significance level, giving a moderate validity to the discriminant function.

49 (79.03%) of 62 observations were correctly classified, indicating that this classification is fairly effective.

In Table 10.7, three variables of financial risk effectively discriminate between the two industry groups (19 plant exporters and 24 construction firms), with V132 as the most significantly discriminated variable and V138 the least. The group means[a] of the three discriminated variables are as follows:

	Plant	Construction		Plant	Construction
V132	1.842	4.583	V138	3.000	2.000
V135	4.579	5.917			

TABLE 10.7

DISCRIMINATED SUMMARY TABLE: INDUSTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V132	1	.635	.0000	Inflation
2	V135	2	.607	.0000	Delay in payment
3	V138	3	.543	.0000	Creditworthiness of contractors

Source: The output of SPSS (Discriminant Analysis) for question No. 15.

The output of SPSS Canonical Discriminant Functions for question No.15 shows that the eigenvalue, canonical correlation, Wilks lambda and significance, at 0.842, 0.676, 0.543 and 0.0000, respectively, indicate a strong discriminating power and significance level. Consequently, we can conclude that there is a significant difference in the respective industry group centroids at 0.0000 significance level and the validity of the discriminant function can be effectively verified.

From a total of 43 observations, 34 (79.07%) were correctly classified, indicating that this classification function is also fairly effective at a similar level to that of the country groups.

In table 10.8 firms from both country groups regard V135 (delay in payment) as the most important source of financial risk (with a mean score > 5.0), and V134 (exchange rate fluctuations) and V132 (inflation) as the second and the third important sources, respectively. However, the extent to which other country firms consider these three sources of financial risk to be important is far stronger than that of the Korean firms.

TABLE 10.8

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO FINANCIAL RISK EXPERIENCED IN OVERSEAS PLANT AND CONSTRUCTION CONTRACTS

Variable Number	Factors	Weighted Mean Score: Korea (a)	Weighted Mean Score: 11 Other Countries(b)
* V132	Inflation	2.786(3)	4.650(3)
* V133	Availability of foreign exchange	1.833(6)	3.800(4)
V134	Exchange rate fluctuations	3.476(2)	4.900(2)
* V135	Delay in payment	5.143(1)	5.750(1)
* V136	Repatriation of funds (profit)	1.619(7)	2.750(5)
V137	Local taxes and royalties	1.857(5)	2.650(6)
* V138	Creditworthiness of contractors	2.714(4)	1.550(7)

Source: See Table 10.5. The values are from 7 (the most important) to 1 (the least important).

Note: See Table 10.5.

In general, Korean firms consider all sources of financial risk except V138 (creditworthiness of contractors) to be less important than other firms involved in overseas plant and construction contracts.

Political Risk

In Table 10.9, three variables of political risk effectively discriminate between the two country groups.

V144 (use of local firms and agents) is the most significantly discriminated variable and V141 (war or revolution) the least.

The group means[a] of these two variables are as follows:

	Korea	11 others		Korea	11 others
V144	1.548	2.950	V141	2.000	2.850

TABLE 10.9

DISCRIMINATED SUMMARY TABLE: COUNTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V144	1	.8668	.0035	Use of local firms and agents
2	V142	2	.8217	.0030	Constraints on employment of expatriate staff
3	V141	3	.7942	.0037	War or revolution

Source: The output of SPSS (Discriminant Analysis) for question No. 16.

The eigenvalue, canonical correlation, Wilks lambda and significance, 0.259, 0.454, 0.794 and 0.0037, respectively, reveal that the three variables have a weak discriminant power and that the validity of the discriminant function is weak. However, there is a significant difference in country group centroids at 0.0037 significance level.

The classification function is moderately effective since 42

(67.74%) of 62 observations were correctly classified.

The industry group results concerning political risk are not discussed since no variable was strong enough to qualify for the analysis.

Table 10.10 shows that both Korean and other plant and construction firms consider V143 (customs and import restrictions) to be the most important source of political risk (with a mean score > 2.45). However, political risk is considered by both groups to be fairly low compared with that of financial risk (see Table 10.3).

On the whole, plant and construction firms of other countries regard all political risk sources except two (V142 and V145) as being more important than those of Korea. In particular, the attitudinal differences between two groups are significant in V141 (war or revolution) and V144 (use of local firms and agents).

TABLE 10.10

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO POLITICAL RISK EXPERIENCED IN OVERSEAS PLANT AND CONSTRUCTION CONTRACTS

Variable Number	Factors	Weighted Mean Scores	
		Korea (a)	11 Other Countries (b)
* V141	War or revolution	2.000(2)	2.850(3)
* V142	Constraints on employment of expatriate staff	1.976(3)	1.900(4)
V143	Customs and import restrictions	2.452(1)	3.200(1)
* V144	Use of local firms and agents	1.548(4)	2.950(2)
V145	Regional differences in regulation	1.286(5)	1.150(5)

Source: Table 10.5.

Note: Table 10.5.

Logistical Risk

According to the output of SPSS Discriminant Analysis for question No.17, two of four variables in logistical risk effectively discriminate at 0.0011 significance level between the two country groups. These two sources of logistical risk are V146 (embargo) and V148 (availability of materials). But the importance of logistical risk experienced by the country groups is relatively low compared with that of the other four types of risk (see Table 10.3).

Although the significance level of three variables discriminated effectively between the two industry groups, namely V148, V149 (availability of expertise), and V146 is over 0.05, the variables selected in both country and industry groups have a very weak discriminant power.

Construction Risk

In Table 10.11, two of five sources of construction risk effectively discriminate between the two country groups which have exerienced construction risk in plant and construction contracts.

TABLE 10.11

DISCRIMINATED SUMMARY TABLE: COUNTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V150	1	.7084	.0000	Productivity of resources and inappropriate plant
2	V151	2	.6510	.0000	Weather and seasonal implications

Source: The output of SPSS (Discriminant Analysis) for question No. 18.

These two sources of construction risk are V150 (productivity of resources and inappropriate plant) and V151 (weather and seasonal implications).

The group means[2] of these two variables are as follows:

	Korea	11 others		Korea	11 others
V150	1.119	3.400	V151	2.571	2.600

The four standard criteria, namely eigenvalue, canonical correlation, Wilks lambda and significance, at 0.536, 0.591, 0.651 and 0.0000, respectively, indicate that the two variables have a moderate discriminant power and there is a significant difference in the respective country group centroids at 0.0000 significance level. Thus, the discriminant function is moderately effective.

49 (79.03%) of total 62 firms were correctly classified, indicating this classification is fairly effective.

The discriminant analysis results of the industry groups associated with construction risk are not discussed here since the selected one variable (V154, suitability of materials) has a very weak discriminant power and significance level is over 0.06, and except for this variable there is no significant difference in industry group centroids.

As shown in Table 10.12, Korean firms regard V151 (weather and seasonal implications) as the most important source of construction risk with a quite similar importance level to non-Korean firms, which consider that variable to be the second most important one.

Other country firms consider V150 (productivity of resources and inappropriate plant) to be the most important source of construction risk (with a mean score of 3.400). In contrast, Korean firms regard V150 as the second least important source (with a mean score of 1.119).

TABLE 10.12

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO CONSTRUCTION RISK EXPERIENCED IN OVERSEAS PLANT AND CONSTRUCTION CONTRACTS

Variable Number	Factors	Weighted Mean Scores: Korea (a)	Weighted Mean Scores: 11 Other Countries(b)
* V150	Productivity of resources and inappropriate plant	1.119(4)	3.400(1)
* V151	Weather and seasonal implications	2.571(1)	2.600(2)
V152	Industrial relations	0.857(5)	1.250(5)
V153	New or different methods of construction	1.548(3)	1.750(4)
V154	Suitability of materials	2.405(2)	2.400(3)

Source: Table 10.3 and 10.11.
Note: Table 10.3.

All firms regard V152 (industrial relations) as the least important source of construction risk (with a mean score of 0.857 and 1.250 respectively).

10.1.2 RISK ANALYSIS

According to the output of SPSS Cross-analysis for question No. 19 of the questionnaire, 50 (82.0%) of the 61 firms claimed that they had formally analysed some of the risks encountered in plant and construction contracts. Only 4 firms (6.6%) replied that they had made no risk analysis.

In comparison with the two country groups (Korea and 11 other countries) based on the output of SPSS Cross-analysis, 35 (85.4%) of the 41

Korean firms and 15 (75.0%) of the 20 foreign firms claimed to have analysed risks which materialised. Two Korean firms (4.9%) and two other country firms (10%) made no risk analysis.

Techniques of Risk Analysis

The measurement of risk can be attained by a number of techniques each with varying degrees of sophistication and limitation.

Table 10.13 shows a country comparison with regard to risk analysis techniques by which the risks encountered in overseas plant and construction contracts tend to be analysed.

About 86.0% of all firms commonly rely on management perceptions of probable difficulties. Probability analysis is especially favoured by Korean firms(40.0%) and sensitivity analysis by non-Korean firms(52.9%).

TABLE 10.13

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO RISK ANALYSIS TECHNIQUES BY WHICH THEIR RISKS ENCOUNTERED HAVE BEEN ANALYSED

Techniques	Total		Korea (a)		11 Other Countries(b)	
	No. of Firms	%	No. of Firms	%	No. of Firms	%
Sensitivity Analysis	16	30.8(3)	7	20.0(4)	9	52.9(2)
Probability Analysis	22	42.3(2)	14	40.0(2)	8	47.1(3)
Monte Carlo Principle	1	1.9(6)	0	0.0(6)	1	5.9(5)
Decision Tree Analysis	9	17.3(5)	5	14.3(5)	4	23.5(4)
Utility Theory	11	21.2(4)	11	31.4(3)	0	0.0(6)
Management Perceptions	45	86.5(1)	30	85.7(1)	15	88.2(1)

Source: The output of SPSS (Crosstabulation Analysis) for question No.20 (variables from V156 to V161).

Note: 1. (a) 35 companies (b) 17 companies, 11 countries.
2. Figures in brackets indicate ranking according to frequency used.

Firms rarely use the Monte Carlo principle or utility theory, presumably in consequence of limited mathematical abilities and/or a scepticism towards the usefulness of sophisticated analyses on the part of decision makers.

The significant difference between the two country groups is that 11 (31.4%) of 35 Korean firms have commonly used utility theory as their analytical tool in contrast to none of the 17 foreign firms. Inyang (1983) has suggested that, until a more suitable approach is derived, utility theory give the best way of quantitatively defining attitudes to risk. However, further research with regard to such a significant difference between two groups may be required.

10.1.3 RISK RESPONSE

Risk response can be considered in terms of avoidance (reduction), transfer or retention.

The two country groups are compared and discussed only in terms of group means associated with risk response because of the absence of clear explanatory variables in the discriminant analysis.

As shown in Table 10.14, both country groups regard risk reduction as the response to which they have most frequently resorted in overseas plant and construction contracts. This method is the top ranked in both groups, with a mean score > 2.200. The two country groups consider risk transfer to be the second most frequently resorted response (with a mean score > 2.100), followed by risk avoidance (with a mean score > 1.600), and risk retention to be the least, with a mean score < 0.650.

This pattern suggests that firms from both country groups first assess the risks encountered in overseas plant and construction contracts and then resort chiefly to risk reduction and transfer to remove or minimise unexpected cost and time overruns.

TABLE 10.14

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO RISK RESPONSE APPLIED IN OVERSEAS PLANT AND CONSTRUCTION CONTRACTS

Variable Number	Methods of Risk Response	Weighted Mean Scores	
		Korea (a)	11 Other Countries(b)
V162	Avoidance	2.095(3)	1.600(3)
V163	Reduction	2.381(1)	2.200(1)
V164	Transfer	2.190(2)	2.100(2)
V165	Retention	0.548(4)	0.650(4)

Source: Calculated from the output of SPSS (Discriminant Analysis Program) for question No. 21. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: from 4 (the most frequent) to 1 (the least frequent).

Note: Table 10.3.

Transfer of Risk

The four most common methods for the transfer of risk in plant and construction contracts are as follows: (a) client to contractor or designer; (b) contractor to sub-contractor; (c) client, contractor, sub-contractor or designer to insurer; and (d) contractor or sub-contractor to surety.

Table 10.15 shows a comparison between Korea and other countries with regard to the methods for the transfer of risk in overseas plant and construction contracts. The method which has been most frequently applied by both country groups is the transfer from client, contractor, sub-contractor or designer to insurer, with 17 (51.5%) of 33 Korean firms and 13 (76.5%) of 17 foreign firms using this method for the transfer of risk.

The second most frequently applied method for both groups taken together is the transfer from client to contractor or designer in Korea and from contractor to sub-contractor in 11 other countries, but all the firms using this method are Korean.

TABLE 10.15

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO THE METHODS FOR THE TRANSFER OF RISK IN PLANT AND CONSTRUCTION CONTRACTS.

Methods for The Transfer	Total		Korea (a)		11 Other Countries(b)	
	No. of Firms	%	No. of Firms	%	No. of Firms	%
Client to contractor or Designer	8	16.0(3)	8	24.2(2)	0	0.0(4)
Contractor to Sub-contractor	10	20.0(2)	7	21.2(3)	3	17.6(2)
Client, contractor, sub-contractor or designer to Insurer	30	60.0(1)	17	51.5(1)	13	76.5(1)
Contractor or sub-contractor to Surety	2	4.0(4)	1	3.0(4)	1	5.9(3)

Source: The output of SPSS (Crosstabulation Analysis) for question No.22 (variable V166).

Note: 1. (a) 33 companies (b) 17 companies, 11 countries.
2. Figures in brackets indicate ranking according to frequency applied.

Types of Contract Appropriate for Avoidance or Reduction of Risks

Table 10.16 compares the types of contract which are most appropriate in avoiding or reducing contract risks.

Both groups regard the cost-reimbursable contract as the most appropriate. The characteristics of the cost-reimbursable contract are: (a) It is the most appropriate from the contractor's viewpoint for high risk contracts; (b) the element of gambling is removed for the contractor.

TABLE 10.16

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO THE TYPES OF CONTRACT APPROPRIATE FOR AVOIDANCE OR REDUCTION OF RISKS

Types of Contract	Total		Korea (a)		11 Other Countries(b)	
	No. of Firms	%	No. of Firms	%	No. of Firms	%
Lump sum	14	23.0(2)	11	26.8(2)	3	15.0(2)
Admeasurement	4	6.6(3)	3	7.3(3)	1	5.0(3)
Cost-reimbursable	43	70.5(1)	27	65.9(1)	16	80.0(1)
Target Cost	--	--	--	--	--	--

Source: The output of SPSS (Crosstabulation Analysis) for question No.23.
Note: 1. (a) 41 companies (b) 20 companies, 11 countries.
2. Figures in brackets indicate ranking according to frequency considered.

Both country groups also consider lump sum and admeasurement contract to be the second and the third appropriate type of contract to avoid or reduce contract risks.

10.1.4 AN ANALYSIS OF REGIONS IN WHICH THE SIXTY-TWO SAMPLE FIRMS HAVE EXPERIENCED RISKS IN OVERSEAS PLANT AND CONSTRUCTION CONTRACTS

Table 10.17 shows that three of seven regions in which the two country groups have experienced risks in overseas plant and construction exports effectively discriminate. The most significantly discriminated region is V173 (Latin America), followed by V169 (Middle-East); the least is V171 (Europe).

TABLE 10.17

DISCRIMINATED SUMMARY TABLE: COUNTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V173	1	.5932	.0000	Latin America
2	V169	2	.5243	.0000	Middle-East
3	V171	3	.5034	.0000	Europe

Source: The output of SPSS (Discriminant Analysis) for question No. 24.

The group means[4] of these three regions are as follows:

	Korea	11 others		Korea	11 others
V173	0.262	3.300	V169	5.929	4.650
V171	0.143	1.500			

The four standard criteria to verify the validity of the discriminant function, namely, the eigenvalue, canonical correlation, Wilks lambda and significance are 0.985, 0.704, 0.504 and 0.000, respectively. Thus, the three regions have a strong discriminating power and there is a significant difference in the respective country group centroids at 0.000 significance level. The discriminant function is highly effective, with 51 (82.26%) of 62 observations being correctly classified.

Industry group results for the regions in which 19 plant and 24 construction firms have experienced risk are not discussed because the selected three regions, namely, V172 (North America), V173 (Latin

America) and V170 (Africa) have a very weak discriminant power and significance level is over 0.22.

Table 10.18 shows the country comparisons between Korean firms and those of other countries with regard to the regions in which they have experienced risks in plant and construction exports.

TABLE 10.18

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO THE REGIONS IN WHICH 62 SAMPLE FIRMS HAVE EXPERIENCED RISKS

Variable Number	Regions	Weighted Mean Scores: Korea (a)	Weighted Mean Scores: 11 Other Countries (b)
V168	South-East Asia	3.524(2)	3.850(2)
* V169	Middle-East	5.929(1)	4.650(1)
V170	Africa	2.333(3)	3.500(3)
* V171	Europe	0.143(7)	1.500(5)
V172	North America	0.405(4)	0.850(6)
* V173	Latin America	0.262(6)	3.300(4)
V174	Oceania	0.310(5)	0.300(7)

Source: See Table 10.17. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: from 7 (the most frequent) to 1 (the least frequent).

Note: Table 10.3.

As shown in the table, both country groups regard the Middle-East as the most frequently experienced region with a mean score of 5.929 and 4.650, respectively, followed by South-East Asia and Africa, the regions where their exporting has mainly occurred*. Thus, for example, Korean construction firms and those of seven other countries (i.e. excluding Belgium, Sweden, Singapore and Taiwan) were awarded a total of USB$ 38.2 and USB$ 325.3, respectively, in foreign contracts from 1982 to 1986. The Middle-East has been the most favoured market for both Korean contractors and those of the seven other countries in recent years, accounting for 65.4% and 30.1% of their total contract volume, followed by South-East Asia (23.3% and 23.9%) and Africa (10.7% and 14.7%), respectively. Elsewhere, a low level of regional risk is reported, except that other countries have experienced some risk in Latin America (with a mean score of 3.300) where economic and political conditions have been unstable due to a high volume of foreign debt.

10.2 CONTRACT STRATEGY

This section presents attitudinal differences between the country and the industry groups with respect to: a) organisational structures for design and construction; b) types of contract; c) the tendering process; and d) the incidental conditions of contract imposed by importing countries. A stepwise discriminant analysis is again employed, and as before only the significantly discriminated variables (significance level < 0.05) between groups and the important factors ranked by the country groups will be presented.

10.2.1 ORGANISATIONAL STRUCTURES FOR DESIGN AND CONSTRUCTION

Many choices are available to the client and his project manager for the management and performance of design and construction. Table

10.19 shows the discriminating variables, from among six methods (discussed in section 5.2), which significantly discriminate between the two country groups, of which firms have most tender experience in cases of successful tender.

TABLE 10.19

DISCRIMINATED SUMMARY TABLE WITH REGARD TO ORGANISATIONAL STRUCTURES FOR DESIGN AND CONSTRUCTION: COUNTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V214	1	.8354	.0011	Management contracting
2	V216	2	.8147	.0024	Direct labour force account

Source: The output of SPSS (Discriminant Analysis) for question No. 37.

The most significantly discriminated variables are V214 (management contracting, separate management of design and construction).

The group means* of these two variables are as follows:

	Korea	11 Others		Korea	11 Others
V214	0.786	2.550	V216	0.881	0.650

The validity of the discriminant function is fairly weak and the selected two discriminant variables have a weak discriminating power since the eigenvalue, canonical correlation, Wilks lambda are 0.228, 0.431 and 0.815, respectively. But there is a significant difference in country group centroids at 0.0024 significance level.

The results show that this classification function is moderately effective since 46 (74.2%) from a total of 62 observations were correctly classified.

As shown in Table 10.20, three variables effectively discriminate between the two industry groups (19 plant exporters and 24 construction firms), namely V211 (conventional approach, divided management of design and construction), V212 (cost-reimbursable or target contract, co-operative management of design and construction) and V215 (package deal or turnkey contract, integrated management of design and construction).

TABLE 10.20

DISCRIMINATED SUMMARY TABLE WITH REGARD TO ORGANISATIONAL STRUCTURES FOR DESIGN AND CONSTRUCTION: INDUSTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V211	1	.7947	.0023	Conventional approach
2	V212	2	.7072	.0010	Cost-reimbursable or target contract
3	V215	3	.6647	.0011	Package deal or turnkey contract

Source: Table 10.19.

The group means* of these two variables are as follows:

	Plant	Construction		Plant	Construction
V211	2.526	4.917	V212	2.368	1.500
V215	4.158	3.542			

The group means show that plant exporters have mostly tendered successfully under a package deal or turnkey contract arrangement and construction firms under conventional methods. The contract mode favoured by plant exporters reflects the higher technological content of their activities.

From the standard criteria (namely, eigenvalue, canonical correlation, Wilks lambda and significance at 0.505, 0.579, 0.665 and 0.0011, respectively) the three variables are seen to have a moderate discriminant power and there is a significant difference in the respective industy group centroids at 0.0011 significance level. Accordingly, the validity of the discriminant function is moderately effective. From a total of 43 firms 33 (76.7%) were correctly classified.

Table 10.21 gives the results of the country comparisons with regard to the preferred organisational structures for design and construction.

Both country groups are seen to favour the conventional method (divided management of design and construction) and the package deal or turnkey contract (integrated management of design and construction). Of these two methods, the latter is more frequent among Korean firms.

TABLE 10.21

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES REGARDING ORGANISATIONAL STRUCTURES FOR DESIGN AND CONSTRUCTION EXPERIENCED IN OVERSEAS PLANT AND CONSTRUCTION CONTRACTS

Variable Number	Methods for the Management and Execution of Design and Construction	Weighted Mean Scores	
		Korea (a)	11 Other Countries (b)
V211	Conventional approach	3.476(2)	4.450(1)
V212	Cost-reimbursable or target contract	1.690(3)	2.250(4)
V213	Fee contracting	1.286(4)	2.050(5)
* V214	Management contracting	0.786(6)	2.550(3)
V215	Package deal or turnkey contract	4.238(1)	3.850(2)
* V216	Direct labour force account	0.881(5)	0.650(6)

Source: Table 10.19. Calculation was based on multiplying the frequency count of each value by weights given to these values: from 6 (the most frequent) to 1 (the least frequent).

Note: See Table 10.3.

Although firms from both country groups appear to have little experience of the direct labour force account, an interesting feature is the low utilisation by Korean firms of management contracting relative to other firms. The management contract is particularly suitable for large and complex projects which require flexible management, especially regarding design change and the co-ordination of multi-contractual arrangements. It may be true that Korean plant and construction firms are relatively unsuited to bid successfully for large projects which require complicated technology in consequence of their weak engineering and design capability.

10.2.2 TYPES OF CONTRACT

This sub-section will present an empirical survey of contract selection with respect to: a) types of contract in overseas plant and construction contracts; b) the evaluation of the contract; and c) the risk contingency and the adjustment of contract price in a lump sum contract.

Types of Contract in Overseas Plant Contract

Table 10.22 shows a comparison of the types of contract selected by 42 Korean firms in overseas plant contracts. The lump sum contract is the most frequently selected contract type (with a mean score of 3.571), followed by admeasurement and the cost-reimbursable contract.

The target cost contract is the least frequently selected contract type. The preference for the lump sum contract, which imposes maximum incentive and contingency sum on the contractor in comparison to a cost-reimbursable or target cost (see Figure 5.4), may lead Korean firms to seriously underestimate the risks to be encountered. This is because lump sum contracts are usually let by competitive tender and the lowest bidder is likely to be the one which has most seriously underestimated the risks.

TABLE 10.22

A COMPARISON OF THE TYPES OF CONTRACT SELECTED BY KOREAN PLANT AND CONSTRUCTION FIRMS IN OVERSEAS PLANT CONTRACTS

Variable Number	Types of Contract	Weighted Mean Scores Korea (a)
V195	Lump sum	3.571 (1)
V196	Admeasurement	1.524 (2)
V197	Cost-reimbursable	1.310 (3)
V198	Target cost	0.571 (4)

Source: The output of SPSS (Discriminant Analysis) for question No. 30. Calculation was based on multiplying the frequency count of each value by weights given to these values from 4(the most frequent) to 1 (the least frequent).

Note: 1. (a) 42 companies.

2. Figures in brackets indicate ranking according to frequency experienced.

Types of Contract in Overseas Construction Contracts

As shown in Table 10.23, V201 (cost-reimbursable) effectively discriminates between the two country groups. Non-Korean firms show a more frequent selection of this type of contract. [The group means[7] of this variable is 1.238 (Korea) and 2.250 (11 other countries).]

However, this single variable has a very weak discriminant power and validity (the canonical correlation coefficient and eigenvalue are very small, 0.286 and 0.089) and the classification function is only slightly effective because only 41 (59.7%) from a total of 62 firms were correctly classified.

TABLE 10.23

DISCRIMINATED SUMMARY TABLE: COUNTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V201	1	.9180	.0241	Cost-reimbursable contract

Source: The output of SPSS (Discriminant Analysis) for question No. 31.

Three types of contract effectively discriminate between the two industry groups (Table 10.24). These are V200 (admeasurement), V199 (lump sum) and V202 (target cost).

The group means[7] of these three variables are as follows:

	Plant	Construction		Plant	Construction
V200	0.421	2.125	V199	2.421	3.250
V202	0.842	0.375			

TABLE 10.24

DISCRIMINATED SUMMARY TABLE: INDUSTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V200	1	.7252	.0003	Admeasurement contract
2	V199	2	.6815	.0005	Lump sum contract
3	V202	3	.6588	.0009	Target cost contract

Source: Table 10.23.
Note: The eigenvalue and canonical correlation of discriminant function are 0.518 and 0.584, respectively.

Plant exporters have mostly been associated with lump sum contracts and construction firms with both lump sum and admeasurement.

The selected three variables have a moderate discriminant power and the validity of the discriminant function is moderately effective (See Table 10.24). There is a significant difference in the respective industry group centroids at 0.0009 significance level, with 31 (72.1%) of 43 observations being correctly classified.

Table 10.25 gives an inter country comparison with regard to the types of contract with which firms have been associated in overseas construction contracts. For both country groups the lump sum has been the most frequently experienced contract.

TABLE 10.25

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES REGARDING THE TYPES OF CONTRACT ASSOCIATED WITH IN THE OVERSEAS CONSTRUCTION CONTRACTS

Variable Number	Types of Contract	Weighted Mean Scores	
		Korea (a)	11 Other Countries(b)
V199	Lump sum	3.048(1)	3.150(1)
V200	Admeasurement	1.333(2)	1.300(3)
* V201	Cost-reimbursable	1.238(3)	2.250(2)
V202	Target cost	0.476(4)	0.597(4)

Source: Table 10.23. Calculation was based on multiplying the frequency count of each value by weights given to these values: from 4 (the most frequent) to 1 (the least frequent).

Note: See Table 10.3.

But neither group has had much experience of the target cost contract. There is a significant difference between these two groups in the cost-reimbursable contract, with non-Korean firms having more experience of this type of contract which is commonly employed in projects which involve technical innovation and multi-contract complexity.

Evaluation of the Type of Contract

When assessing the type of contract, early consideration should be given to: a) the ability to meet project objectives; b) contractor's incentive; c) client's flexibility; and d) contractor's risk allocation (see Figure 5.4).

Table 10.26 shows that V203 (the ability to meet project objectives) effectively discriminates between the two country groups.

With group means* of 3.703 (Korea) and 4.467 (other countries), non-Korean firms express a much greater degree of satisfaction with their ability to meet their project objectives.

TABLE 10.26

DISCRIMINATED SUMMARY TABLE: COUNTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V203	1	.7575	.0002	The ability to meet project objectives

Source: The output of SPSS (Discriminant Analysis) for question No. 32.

The variable has a weak discriminant power since the canonical correlation coefficient is small (0.320), but there is a significant difference in country group centroids at 0.0002 significance level and the classification function is fairly effective with 46 (82.14%) of the 56 observations being correctly classified.

In Table 10.27, one variable, V204 (incentive) effectively discriminates between the two industry groups. The group means* are 3.059 (plant exporters) and 3.632 (construction firms), indicating that construction firms are much satisfied with the contractor's incentive compared with plant exporters.

TABLE 10.27

DISCRIMINATED SUMMARY TABLE: INDUSTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V204	1	.8392	.0154	Contractor's incentive

Source: Table 10.26.

The selected discriminant variable (V204) has a weak discriminant power because of a small value of the canonical correlation coefficient (0.401). The results show that this classification function is moderately effective since 26 (72.2%) of a total of 36 observations were correctly classified.

Table 10.28 shows a country comparison with regard to the evaluation of type of contract in overseas plant and construction contracts. In general, non-Korean firms are seen to be more satisfied with whatever methods they use for contract evaluation.

Firms in both country groups rank the effectiveness of the various methods in the same order, and this preference for performance incentives explains the prevalence of lump sum contracts (see Figure 5.4 and Table 10.25).

Finally, Korean plant and construction firms are fairly dissatisfied with contractor's risk allocation when assessing the type of contract which they have selected (with a mean score of 2.892), implying that Korean firms probably pay insufficient attention to risk contingency fund estimates for inclusion in the tender price.

TABLE 10.28

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES REGARDING THE EVALUATION OF TYPE OF CONTRACT IN OVERSEAS PLANT AND CONSTRUCTION CONTRACTS

Variable Number	Factors	Weighted Mean Scores: Korea (a)	11 Other Countries (b)
* V203	The ability to meet project objectives	3.703(1)	4.467(1)
V204	Contractor's incentives	3.270(2)	3.800(2)
V205	Client's flexibility	3.000(3)	3.733(3)
V206	Contractor's risk allocation	2.892(4)	3.467(4)

Source: Table 10.26. Calculation was based on multiplying the frequency count of each value by weights given to these values: from 5 (very satisfactory); 4(quite satisfactory); 3(neutral); 2 (quite unsatisfactory); and 1(very unsatisfactory).

Note: 1. * represents significantly discriminated variable.
2. (a) 37 companies (b) 15 companies, 11 countries.
3. Figures in brackets indicate ranking according to frequency evaluated.

The Risk Contingency in a Lump Sum Contract

In a lump sum contract the contractor carries all risk which, therefore, should be effectively assessed and discounted in the tender price. The failure to adequately assess risk may partly account for the reputation gained by Korean firms for highly competitive tendering. According to the output of SPSS Discriminant Analysis for question No. 33, the variable V207 (significance of risk in a lump sum contract) in the two country groups has a very weak discriminant power and the significance level is 0.159. Accordingly the discriminant analysis results of the country groups are not presented. But as shown in Table 10.29, this variable significantly discriminates between the two industry groups (19 plant exporters and 24 construction firms).

TABLE 10.29

DISCRIMINATED SUMMARY TABLE: INDUSTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V207	1	.8368	.0072	Significance of risk in a lump sum contract

Source: The output of SPSS (Discriminant Analysis) for question No. 33.
Note: The eigenvalue and canonical correlation coefficient of discriminant function are 0.195 and 0.404, respectively.

With group means[9] for this variable (V207) of 3.632 (plant) and 4.375 (construction), construction firms appear to be more aware of contract risks when they compute their risk contingency fund.

The discriminating variable (V207) has a weak discriminant power because the canonical correlation coefficient is small (0.404). But there is a significant difference in group centroids (plant and construction) at 0.0072 significance level.

Table 10.30 shows the country comparison with regard to the significance of a risk contingency in the lump sum contract. Foreign firms generally consider the risk contingency to be more significant than do Korean firms. That is to say, 10 (52.6%) of the 19 foreign firms considered the risk contingency to be very significant, in contrast to only 8 (20.0%) of the 40 Korean firms.

Thus, it appears that Korean plant and construction firms seriously underestimate the effect of risks encountered in a lump sum contract in order to become competitive bidders.

TABLE 10.30

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES REGARDING THE SIGNIFICANCE OF RISK CONTINGENCY IN A LUMP SUM CONTRACT

	Total		Korea		11 Other Countries	
Significance Level	No. of Firms	%	No. of Firms	%	No. of Firms	%
Very insignificant	0	0.0(5)	0	0.0(5)	0	0.0(4)
Quite insignificant	1	1.7(4)	1	2.5(4)	0	0.0(4)
Neither	10	16.9(3)	8	20.0(2)	2	10.5(3)
Quite significant	30	50.8(1)	23	57.5(1)	7	36.8(2)
Very significant	18	30.5(2)	8	20.0(2)	10	52.6(1)
Total	59	100.0	40	100.0	19	100.0

Source: The output of SPSS (Crosstabulation Analysis) for question No.33.
Note: Figures in brackets indicate ranking according to frequency considered.

An Adjustment of the Contract Price in a Lump Sum Contract

In a lump sum contract change or disruption initiated by the client may cause the contractor to claim for additional payment or time. Thus, a lump sum does not necessarily imply a fixed price. Price may be adjusted for cost escalation.

The output of SPSS Discriminant Analysis for question No. 34 indicates that a discriminant variable, V208 (frequency of adjusting contract price in a lump sum contract) in the two country groups has a very weak discriminant power. Therefore, the discriminant analysis results of the country groups are not discussed here.

But Table 10.31 shows that this variable significantly discriminates between the two industry groups (19 plant exporters and 24 construction firms).

TABLE 10.31

DISCRIMINATED SUMMARY TABLE: INDUSTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V208	1	.7813	.0016	Frequency of adjusting contract price in a lump sum contract

Source: The output of SPSS (Discriminant Analysis) for question No. 33.
Note: The eigenvalue and canonical correlation coefficient of discriminant function are 0.280 and 0.468, respectively.

The group means[10] of this variable (V208) are 2.000 (plant) and 2.917 (construction), which indicate that construction firms have more frequently adjusted the contract price due to a cost escalation in a lump sum contract. A higher incidence of contract change and disruption in construction contracts supports the existence of greater operational risks in this sector associated with shifts in clients' plans.

The discriminant variable has a moderate discriminant power and there is a significant difference in the two industry group centroids at 0.0016 significance level (Table 10.31), with 33 (76.74%) from a total of 43 observations being correctly classified.

Table 10.32 shows a country comparison with regard to the frequencies which firms have adjusted the contract price due to cost escalation or contract changes in a lump sum contract.

TABLE 10.32

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES REGARDING THE FREQUENCIES OF ADJUSTING THE CONTRACT PRICE IN A LUMP SUM CONTRACT

Frequency Level	Total		Korea		11 Other Countries	
	No. of Firms	%	No. of Firms	%	No. of Firms	%
Never	9	15.0(4)	7	17.1(3)	2	10.5(4)
Seldom	26	43.3(1)	22	53.7(1)	4	21.1(3)
Sometimes	13	21.7(2)	8	19.5(2)	5	26.3(2)
Often	10	16.7(3)	3	7.3(4)	7	36.8(1)
Always	2	3.3(5)	1	2.4(5)	1	5.3(5)
Total	60	100.0	41	100.0	19	100.0

Source: The output of SPSS (Crosstabulation Analysis) for question No.34.
Note: Figures in brackets indicate ranking according to frequency adjusted.

Foreign firms (68.4%) generally have more frequently experienced an adjustment to their contract price than have Korean firms (29.2%). From this evidence Korean plant and construction firms should be more prepared to press for adjustments to the contract price whenever they suffer contract changes initiated by their client or a cost escalation in a lump sum contract. Otherwise, they are more likely than their competitors to incur loss after finishing their projects (see Table 9.2 in the SM-CF Project and Table 9.4 in the AK-PH Housing Project).

10.2.3 TENDERING PROCESS

This sub-section concentrates primarily on the empirical survey associated with the tendering process for the appointment of contractors. The major contents covered are as follows: a) tender preparation; b) estimate of tender and contract documents; c) tendering procedure; and d) tender analysis.

Tender Preparation

According to the output of SPSS Cross-analysis for question No. 25 of the questionnaire, 57 (93.4%) of the 61 firms claimed that they had formally carried out estimating work to enable them to submit a tender. Only 2 firms (3.3%) replied that they had made no estimates.

In comparison with the two country groups, 37 (90.2%) of the 41 Korean firms and all 20 foreign firms claimed to have undertaken such estimates. Only two Korean firms (4.9%) made no estimates.

Table 10.33 shows that V176 (the degree of competency of estimating work) effectively discriminates between the two country groups. The variable has a strong discriminant power and there is a significant difference in the respective country group centroids at 0.0000 significance level. Thus, the discriminant function is quite effective. And 49 (87.5%) of 56 firms were correctly classified, indicating this classification is highly effective.

TABLE 10.33

DISCRIMINATED SUMMARY TABLE: COUNTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V176	1	.5241	.0000	The degree of competency carrying out the estimating work

Source: The output of SPSS (Discriminant Analysis) for question No. 25.
Note: Eigenvalue and canonical correlation are 0.908 and 0.690, respectively.

The industry group results are not discussed because V176 has a weak discriminant power (canonical correlation: 0.352) and significance level is over 0.02.

As shown in Table 10.34, other country firms appear to have carried out more competent estimating work than Korean firms (with a mean score of 3.650) in support of their tenders, pointing to a major professional weakness in Korean management.

TABLE 10.34

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO THE DEGREE OF COMPETENCY CARRYING OUT THE ESTIMATING WORK

Variable Number	Factor	Weighted Mean Scores	
		Korea (a)	11 Other Countries (b)
* V176	The degree of competency carrying out the estimating work	2.778	3.650

Source: Table 10.33. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: 4 (very adequately); 3 (quite adequately); 2(quite inadequately); and 1 (very inadequately).

Note: 1. * represents significantly discriminated variable.

2. (a) 36 companies (b) 20 companies, 11 countries.

Estimate of Tender and Contract Documents

A successful construction contract depends heavily on the tender documents and any subsequent negotiation before the contract is awarded. The contract documents developed from the tender documents define the contract. Accordingly, both tender and contract documents should be concise and clear. The division of responsibilities and legal obligations between the parties (mainly client and contractor) should also be clearly specified. Furthermore, risks encountered should be identified and unambiguously allocated between the parties.

Table 10.35 shows that V177 (the degree of satisfaction with regard to the quality of tender and contract documents) effectively discriminates between the two country groups.

TABLE 10.35

DISCRIMINATED SUMMARY TABLE: COUNTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V177	1	.8651	.0036	The degree of satisfaction regarding the quality of tender and contract documents

Source: The output of SPSS (Discriminant Analysis) for question No. 26.
Note: Eigenvalue and canonical correlation are 0.156 and 0.367, respectively.

V177 has a weak discriminant power but there is a significant difference in the respective country group centroids at 0.0036 significance level, with 33 (54.10%) of 61 observations being correctly classified.

The discriminant analysis results of the industry groups associated with V177 are not discussed because of the absence of a clear explanatory variable.

As shown in Table 10.36, the plant and construction firms of other countries are relatively more satisfied with the quality of the tender and contract documents of their firms with a mean score of 3.050, and presumably prepare more accurate and concise contract documents, including the clarification of areas of responsibility, than do Korean firms (mean score of 2.610). This represents a further management task in which Korean firms under-perform.

TABLE 10.36

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO THE DEGREE OF SATISFACTION OF THEIR TENDER AND CONTRACT DOCUMENTS

Variable Number	Factor	Weighted Mean Scores: Korea (a)	Weighted Mean Scores: 11 Other Countries(b)
* V177	The degree of satisfaction regarding the quality of tender and contract documents	2.610	3.050

Source: Table 10.35. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: 4 (very satisfactory); 3 (quite satisfactory); 2 (quite unsatisfactory); and 1 (very unsatisfactory).

Note: 1. * represents significantly discriminated variable.
2. (a) 41 companies (b) 20 companies, 11 countries.

Tendering Procedure

There are several different methods available for selecting construction contractors, namely competition, negotiation, two stage, continuity and serial tender, and term contracting. These different methods were briefly defined in Perry (1985). The Wood Report (1975) has more thoroughly described and assessed these different methods (except for term contracting), and Marks et al (1978) have described in detail the negotiated tender and selective tendering. The advantages and disadvantages of open and selective competition, serial tender and negotiation have been summarised in Milne (1980).

The two country groups are compared and discussed only in terms of group means associated with the tendering procedure because the single selected variable (V182, serial tender) has a very weak discriminant power, the significance level is over 0.06 and, except for this variable, there is no significant difference in country group centroids.

Industry group results for tendering procedures are not discussed since the selected two variables (V180, negotiated tender and V178, competitive tender) also have a very weak discriminant power and significance level is over 0.15.

In Table 10.37 both country groups show competitive tendering to be the method of tender which they have most frequently experienced in overseas plant and construction contracts. This method is the top ranked in both groups, with a mean score > 5.500, followed by negotiated tendering (with a mean score > 4.095) and two stage tender (with a mean score > 2.750).

TABLE 10.37

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO THE TENDERING PROCEDURE IN OVERSEAS PLANT AND CONSTRUCTION CONTRACTS

Variable Number	Method of tendering procedure	Weighted Mean Scores: Korea (a)	11 Other Countries(b)
V178	Competitive (open and selective) tender	5.667(1)	5.550(1)
V179	Two stage tender	2.690(3)	2.750(3)
V180	Negotiated tender	4.095(2)	4.150(2)
V181	Continuity tender	1.952(4)	1.800(4)
* V182	Serial tender	1.238(5)	0.450(5)
V183	Term contracting	0.405(6)	0.250(6)

Source: Calculated from the output of SPSS (Discriminant Analysis) for question No. 27. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: from 6 (the most frequent) to 1 (the least frequent).

Note: See Table 10.3.

Clearly, clients undoubtedly prefer the competitive or negotiated tendering to other tendering procedures when placing an order because this allows them to select a restricted number of bidders or to negotiate with a single reputable and reliable contractor whom they know. To begin to enjoy the benefits of such recognition Korean firms must raise the level of their technological competence.

Tender Analysis

The tender documents of the contractors should be fully responsive to clients needs with respect to delivery, performance, the proposed method of construction, the plan, and the adequacy of resources in addition to price.

Perry (1985) identified four different regimes of tender variables for which different methods of tender analysis are appropriate. They are as follows: evaluation of bids; (a) with financially explicit variables; (b) with several quantifiable variables; (c) with both quantifiable and qualitative variables; and (d) with subjective variables. However, these regimes may occur in combination.

The country group analysis is confined to a) above because this is the most commonly encountered regime and applicable to many lump sum and admeasurement contracts. That of the industry groups is not discussed because the selected two variables (V187 and V190) have a very weak discriminant power and significance level is over 0.19. For b) above, results are analysed which relate to the experiences of Korean firms.

In Table 10.38, four of seven variables effectively discriminate between the country groups which have evaluated tenders on the basis of financially explicit variables for overseas plant and construction contracts.

TABLE 10.38

DISCRIMINATED SUMMARY TABLE: COUNTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V190	1	.9145	.0211	A price comparison
2	V189	2	.8766	.0205	Appreciation of the allocation and implication of risks
3	V186	3	.8494	.0229	Differences in technical contents
4	V184	4	.8314	.0301	Degree of response to the tender documents

Source: The output of SPSS (Discriminant Analysis) for question No. 28.

Note: Eigenvalue and canonical correlation are 0.203 and 0.411, respectively.

V190 (a price comparison between the tender total and the final contract price) is the most significantly discriminated variable and V184 (whether the bids are fully responsive to the tender documents) the least.

The group means* of these two variables are as follows:

	Korea	11 Others		Korea	11 Others
V190	2.881	2.000	V184	3.357	3.150

The eigenvalue, canonical correlation, Wilks lambda and significance, 0.203, 0.411, 0.831 and 0.0300, respectively, reveal that the four variables have a weak discriminant power and that the validity of the discriminant function is weak. However, there is a significant difference in country group centroids at 0.0300 significance level, with 44 (70.97%) of 62 observations being correctly classified.

Table 10.39 shows the country comparisons between Korean firms and others with regard to the tender analysis by which they have evaluated the bids. As shown in the table, both country groups express general dissatisfaction with the evaluation of bids by financially explicit variables except for V184. In particular, foreign firms have reservations about price comparisons (V190) and an evaluation of major differences in timing of payments (V188), with a mean score of 2.000 and 2.050, respectively.

TABLE 10.39

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES WITH REGARD TO THE TENDER ANALYSIS BY WHICH THEY HAVE EVALUATED THE BIDS

Variable Number	Financially explict variables	Weighted Mean Scores: Korea (a)	11 Other Countries (b)
* V184	The responsiveness level of bids to the tender documents	3.357(1)	3.150(1)
V185	Correction of bid prices for arithmetical errors	2.905(2)	2.200(4)
* V186	Differences in technical contents	2.905(2)	2.150(5)
V187	Adequacy of resources and method of construction	2.738(5)	2.450(2)
V188	Major differences in timing of payments	2.643(6)	2.050(6)
* V189	Appreciation of the allocation and implications of risks	2.286(7)	2.300(3)
* V190	A price comparison between the tender total and the final contract price	2.881(4)	2.000(7)

Source: Table 10.38. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: 5 (very satisfactory); 4 (quite satisfactory); 3 (neutral); 2 (quite unsatisfactory); and 1 (very unsatisfactory).

Note: See Table 10.3.

It would appear that foreign firms have frequently experienced considerable differences between their tender total and the final contract price, and also delays in payments due from clients. In contrast, Korean firms have had more favourable experiences (i.e. a comparative advantage in price competition) in reflection of their inclination to make low bids as a result of their underestimated risk contingency funds.

Both country groups are much more satisfied with their bids' responsiveness to the tender documents.

On the whole, Korean plant and construction firms are generally less dissatisfied with their utilisation of financially explicit variables, except V189 (appreciation of the allocation and implications of risks), than those of other countries.

Table 10.40 shows the satisfaction with other quantifiable variables of 37 Korean firms.

Korean plant and construction firms are generally satisfied with duration of construction (V191) and magnitude and timing of mobilisation and advance payments (V192) with a mean score of 3.432 and 3.000, respectively. From this results, it can be inferred that the preferred duration of construction and the magnitude and timing of mobilisation and advance payments specified by Korean contractors have been generally satisfactory to their clients. In other words, Korean firms have received sufficient payment in time as an advance for mobilising the equipment and manpower needed to perform the project.

However, Korean firms have been less satisfied with the expected patterns of payment for measured work (V193) and with the impact of price inflation (V194) with a mean score of 2.784 and 2.486,

TABLE 10.40

THE EVALUATION RESULTS OF BIDS WITH QUANTIFIABLE VARIABLES APPRAISED BY KOREAN FIRMS IN OVERSEAS PLANT AND CONSTRUCTION CONTRACTS

Variable Number	Quantifiable variables	Weighted Mean Scores Korea(a)
V191	Duration of construction	3.432(1)
V192	Magnitude and timing of mobilisation and advance payments	3.000(2)
V193	Expected patterns of payment for measured work	2.784(3)
V194	Price inflation	2.486(4)

Source: The output of SPSS (Discriminant Analysis) for question No. 29. (Calculation: See Table 10.39.)

Note: 1. (a) 37 companies.

2. Figures in brackets indicate ranking according to frequency evaluated.

respectively. Even if a contract price adjustment clause is included, Korean firms sometimes have failed to receive compensation for price inflation. And from the importance of V193 (with a mean score of 2.784), it also appears that Korean firms have not received in time the expected payment for measured work in accordance with the schedule of payments expected to fall due in line with the progress of construction.

10.2.4 INCIDENTAL CONDITIONS OF CONTRACT IMPOSED BY IMPORTING COUNTRIES

It is fairly commonplace for importing countries to impose special, even unreasonable, terms in offers to tender which must be absorbed by any firm wishing to succeed in receiving an order. As a rule, these restrictive conditions involve "Tie-in Clauses" which strongly influence and promote technological cooperation between supplier and importer, effectively locking-out unsuccessful bidders in specific areas. Such arrangements tend to be distorted in favour of advanced countries, particularly for projects which require a high technological level, because firms from advanced countries find it easier to respond.

Table 10.41 shows the discriminating variables which significantly discriminate between the two country groups (Korea and other countries) which have frequently experienced incidental conditions of contract imposed by importing countries in overseas plant and construction contracts.

TABLE 10.41

DISCRIMINATED SUMMARY TABLE WITH REGARD TO INCIDENTAL CONDITIONS OF CONTRACT IMPOSED BY IMPORTING COUNTRIES: COUNTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V221	1	.9191	.0251	Request for long-term after-sales service
2	V220	2	.8691	.0160	Request for unreasonable deferred-payment terms
3	V217	3	.8211	.0092	Request for funds and loans
4	V218	4	.7935	.0094	Request for process management and technology guidance
5	V219	5	.7729	.0113	Request for counter-trade

Source: The output of SPSS (Discriminant Analysis) for question No. 38.

Note: The eigenvalue and canonical correlation coefficient of discriminant function are 0.2938 and 0.4765, respectively.

The most significantly discriminated variables are V221 (request for long-term after sales service) and V220 (request for unreasonable deferred-payment terms); the least are V219 (request for counter-trade) and V218 (request for process management and technology guidance).

The group means' of these four variables are as follows:

	Korea	11 Others		Korea	11 Others
V221	2.262	0.950	V220	2.524	1.700
V219	2.333	2.500	V218	2.667	3.100

The five discriminant variables have a moderate discriminant power because of the canonical correlation with a medium size of 0.4765, and there is a significant difference in country group centroids at 0.0112 significance level, with 47 (75.8%) of 62 observations being correctly classified.

As shown in Table 10.42, three variables effectively discriminate between the two industry groups (19 plant exporters and 24 construction firms), namely V221, V220 and V219.

TABLE 10.42

DISCRIMINATED SUMMARY TABLE WITH REGARD TO INCIDENTAL CONDITIONS OF CONTRACT IMPOSED BY IMPORTING COUNTRIES: INDUSTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V221	1	.8617	.0141	Request for long-term after-sales service
2	V220	2	.7771	.0064	Request for unreasonable deferred-payment terms
3	V219	3	.7489	.0097	Request for counter-trade

Source: Table 10.41.

Note: The eigenvalue and canonical correlation coefficient of discriminant function are 0.3353 and 0.5011, respectively.

The group means[1] of these three variables are as follows:

	Plant	Construction		Plant	Construction
V221	3.158	1.417	V220	2.947	1.708
V219	2.737	1.917			

The group means show that plant exporters have more frequently experienced incidental conditions of contract imposed by importing countries compared with construction firms. In particular, requests for long-term after-sales service (V221) and for unreasonable deferred-payment terms (V220) have been quite frequently experienced by plant exporters. However, the output of SPSS Discriminant Analysis indicates that both industry groups have mostly experienced requests for funds and loans (with a mean score > 3.526) and for process management and technology guidance (with a mean score > 2.708).

From the four standard criteria in Table 10.42, the three variables are seen to have a moderate discriminant power and there is a significant difference in the respective industry group centroids at 0.0097 significance level, with 27 (72.1%) of 43 observations being correctly classified. Accordingly, the validity of the discriminant function is moderately effective.

Table 10.43 gives the results of the country comparisons with regard to the incidental conditions of contract imposed by importing countries.

In both country groups the most frequently experienced incidental conditions imposed at the time of contract are requests for project financing to service the contract (with a mean score > 3.595) and for process management and technology guidance (with a mean score > 2.667), inferring that such requests are common. Of the two country groups, other country firms have more frequently experienced these two incidental conditions compared with Korean firms.

TABLE 10.43

THE COUNTRY COMPARISONS WITH REGARD TO THE INCIDENTAL CONDITIONS OF CONTRACT IMPOSED BY IMPORTING COUNTRIES

Variable Number	Incidental Conditions of Contract (Requested)	Weighted Mean Scores: Korea (a)	Weighted Mean Scores: 11 Other Countries(b)
* V217	For funds and loans	3.595(1)	4.450(1)
* V218	For process management and technology guidance	2.667(2)	3.100(2)
* V219	For counter-trade	2.333(4)	2.500(3)
* V220	For unreasonable deferred-payment terms	2.524(3)	1.700(4)
* V221	For long-term after-sales service	2.262(5)	0.950(5)

Source: Table 10.41. Calculation was based on multiplying the frequency count of each value by weights given to these values: from 5 (the most frequent) to 1 (the least frequent).

Note: See Table 10.3.

Although firms from both country groups appear to have little experience with respect to requests for long-term after-sales service, Korean firms have experienced this condition (with a mean score of 2.262) much more than other country firms. However, it is particularly difficult for Korean firms to carry out long-term post-operations services because of an inadequacy in their overseas administration and management of plant and construction exports.

As shown in Table 10.44, three variables, among six incidental conditions which have influenced winning orders by both Korean and non-Korean firms, effectively discriminate between these two country groups.

V228 (exports on unreasonable deferred-payment terms) is the most significantly discriminated variable and V227 (counter-trade) the least.

The validity of the discriminant function is fairly weak and the selected three discriminant variables have a weak discriminant power (see Table 10.44). But there is a significant difference in country group centroids at 0.0286 significance level, with 42 (67.74%) of 62 observations being correctly classified.

TABLE 10.44

DISCRIMINATED SUMMARY TABLE WITH REGARD TO INCIDENTAL CONDITIONS WHICH HAVE INFLUENCED THE WINNING OF ORDERS: COUNTRY GROUPS

STEP	ACTION ENTERED	VARS IN	WILKS LAMBDA	SIG.	LABEL
1	V228	1	.9563	.1029	Exports on unreasonable deferred-payment terms
2	V225	2	.8902	.0324	Funds and loans
3	V227	3	.8567	.0286	Counter-trade

Source: The output of SPSS (Discriminant Analysis) for question No. 39.
Note: The eigenvalue and canonical correlation coefficient of discriminant function are 0.1673 and 0.3786, respectively.

Industry group results for the incidental conditions which influenced winning orders are not discussed because the selected three discriminant variables have a weak discriminant power (canonical correlation coefficient is 0.423) and significance level is over 0.05.

Table 10.45 indicates the results of the country comparisons with regard to the influence of incidental conditions on winning orders in overseas plant and construction contracts.

A willingness to accede to requests for funds and loans, namely supplier's credit (with a mean score > 2.595) appears to have influenced successful bids by firms from both country groups. In effect, successful bidders usually state their intentions to make a grant of supplier's credit to service the project financing and to give process management and technology guidance for importing countries. Such facilities constitute an important competitive strategy. Of the two country groups, other country firms, which enjoy both an abundant supply of finance and a high level of technology relative to Korean firms, have been more significantly influenced by these two incidental conditions (V225 and V226). In contrast, small and medium-sized Korean firms tend to be excluded from participation in large projects because of their inability to meet such requests.

TABLE 10.45

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES REGARDING THE INCIDENTAL CONDITIONS BY WHICH THEY HAVE BEEN INFLUENCED FOR WINNING THE ORDERS

Variable Number	Incidental Conditions Influenced the Winning of Orders	Weighted Mean Scores	
		Korea (a)	11 Other Countries(b)
* V225	Funds and loans	2.595(1)	2.950(1)
V226	Process management and technology guidance	2.190(2)	2.650(2)
* V227	Counter-trade	1.952(3)	2.000(3)
* V228	Exports on unreasonable deferred-payment terms	1.952(3)	1.300(5)
V229	Importing resources and unnecessary goods	1.048(6)	0.850(6)
V230	Long-term after-sales service	1.286(5)	1.350(4)

Source: Table 10.44. Calculation was based on multiplying the frequency count of each value by weights given to these values: 4(highly influential); 3 (fairly influential); 2 (fairly uninfluential); and 1 (most uninfluential).

Note: See Table 10.3.

10.3 RELATIONSHIPS BETWEEN VARIABLES ASSOCIATED WITH RISK MANAGEMENT AND CONTRACT STRATEGY

In this section, relationships between variables associated a) with risk management and b) with contract strategy are presented by means of a crosstabulation analysis. Only highly significant correlations and fairly strong associations between the two variables will be presented. This section concludes with a discussion of the relationships between risk management and contract strategy.

10.3.1 RELATIONSHIPS BETWEEN VARIABLES ASSOCIATED WITH RISK MANAGEMENT

Technical Risk and Types of Contract

Table 10.46 shows that V121 (technical risk experienced by plant and construction firms) and V167 (types of contract which are most suitable to the avoidance or reduction of contract risks) are significantly correlated at 0.0417 significance level, and there is a moderately strong association between the two variables (Cramer's V = 0.38). From the table, weighted mean scores can be calculated as follows:

Lump sum contract: 35 + 4 + 6 = 45, 45 ÷ 11 = 4.1

Admeasurement: 5 + 4 + 3 + 2 = 14, 14 ÷ 4 = 3.5

Cost-reimbursable: 40 + 48 + 36 + 6 + 6 = 136, 136 ÷ 41 = 3.3.

It can be inferred from the mean scores that plant and construction firms prefer the cost-reimbursable contract to the lump sum when they wish to avoid or reduce contract risks, especially technical risks. The findings of this survey support those of Perry (see Figure 5.4).

TABLE 10.46

A RELATIONSHIP BETWEEN TECHNICAL RISK AND TYPES OF CONTRACT SUITABLE TO THE AVOIDANCE OR REDUCTION OF CONTRACT RISKS

Unit: number of firms, ( ) %

V121 / V167	Experienced Frequencies ← the most 5	4	3	2	the least → 1	Total
Lump sum contract	7(2.5)	1(1.8)	0(0.0)	3(5.4)	0(0.0)	11(19.6)
Admeasurement	1(1.8)	1(1.8)	1(1.8)	1(1.8)	0(0.0)	4(7.1)
Cost-reimbursable	8(14.3)	12(21.4)	12(21.4)	3(5.4)	6(10.7)	41(73.2)
Total	16(28.6)	14(25.0)	13(23.2)	7(12.5)	6(10.7)	56(100)

Source: The output of SPSS (Crosstabulation Analysis) of V121 by V167.

Note: 1. V121 - Technical risk experienced in overseas plant and construction contracts.

2. V167 - Types of contract which are most suitable to the avoidance or reduction of contract risks.

3. Raw chi square = 16.04, Sig. = 0.0417, Cramer's V = 0.378.

<u>Transfer of Risk and Types of Contract</u>

As shown in Table 10.47, there is a significant correlation between V166 (methods of risk transfer) and V167 (types of contract which are most suitable to avoid or reduce contract risks) at 0.05 significance level with a moderate degree of association (Cramer's V = 0.355).

The table also shows that plant and construction firms, which regard cost-reimbursable contract as the most appropriate type of contract to avoid or reduce contract risks, usually transfer their risks from client, contractor, sub-contractor or designer to insurer and from contractor to sub-contractor (accounting for 52.0% and 12.0%, respectively). Clearly, therefore, the insurer plays an important role as a risk transferee in the cost-reimbursable contract.

TABLE 10.47

A RELATIONSHIP BETWEEN THE METHODS FOR TRANSFER OF RISK AND TYPES OF CONTRACT SUITABLE TO THE AVOIDANCE OR REDUCTION OF CONTRACT RISKS

Unit: number of firms, ( ) %

V167 / V166	Types of Contract: Lump sum Contract	Admeasure-ment	Cost-reimbursabe	Total
Client to contractor or designer	2(4.0)	1(2.0)	5(10.0)	8(16.0)
Contractor to subcontractor	4(8.0)	0(0.0)	6(12.0)	10(20.0)
Client, contractor, sub-contractor or designer to insurer	2(4.0)	2(4.0)	26(52.0)	30(60.0)
Contractor or sub-contractor to surety	0(0.0)	1(2.0)	1(2.0)	2(4.0)
Total	8(16.0)	4(8.0)	38(76.0)	50(100)

Source: The output of SPSS (Crosstabulation Analysis) of V166 by V167.
Note: Raw chi square = 12.59, Sig. = 0.0500, Cramer's V = 0.355

10.3.2 <u>RELATIONSHIPS BETWEEN VARIABLES ASSOCIATED WITH CONTRACT STRATEGY</u>

<u>**Quality of Tender and Contract Documents and Degree of Responsiveness to the Tender Documents**</u>

Table 10.48 shows a relationship between V177 (quality of tender and contract documents) and V184 (degree of responsiveness to bids, namely whether the bids are fully responsive to the tender documents).

TABLE 10.48

A RELATIONSHIP BETWEEN QUALITY OF TENDER AND CONTRACT DOCUMENTS AND DEGREE OF RESPONSIVENESS TO BIDS

Unit: number of firms, ( ) %

V184 / V177	Degree of Responsiveness to Bids				
	Quite unsatisfactory	Neutral	Quite satisfactory	Very satisfactory	Total
Quite unsatisfactory	3(5.7)	4(7.5)	8(15.1)	1(1.9)	16(30.2)
Quite satisfactory	0(0.0)	7(13.2)	22(41.5)	5(9.4)	34(64.2)
Very satisfactory	0(0.0)	0(0.0)	0(0.0)	3(5.7)	3(5.7)
Total	3(5.7)	11(20.8)	30(56.6)	9(17.0)	53(100)

Source: The output of SPSS (Crosstabulation Analysis) of V177 by V184.
Note: Raw chi square = 24.2, Sig. = 0.0021, Cramer's V = 0.473

It was found that V177 and V184 are very significantly correlated at 0.0021 significance level and there is a fairly strong association between the two variables (Cramer's V = 0.473).

Of the 53 firms, 56% consider both factors to be quite satisfactory in evaluating their tender and contract documents. Therefore, V184 (whether the bids are fully responsive to the tender documents) plays an important role in assessing the tender and contract.

<u>Quality of Tender and Contract Documents and Differences in Technical Contents of Bids</u>

As can be seen in Table 10.49, V177 (quality of tender and contract documents) is significantly correlated with V186 (differences in technical contents) at 0.0414 significance level, with a fairly strong association (Cramer's V = 0.422).

TABLE 10.49

A RELATIONSHIP BETWEEN QUALITY OF TENDER AND CONTRACT DOCUMENTS AND DIFFERENCES IN THE TECHNICAL CONTENTS OF BIDS

Unit: number of firms, ( ) %

V186 / V177	Differences in Technical Contents of Bids: Very unsatisfactory	Quite unsatisfactory	Neutral	Quite satisfactory	Very satisfactory	Total
Quite unsatisfactory	1(1.9)	7(13.5)	3(5.8)	5(9.6)	0(0.0)	16(30.8)
Quite satisfactory	0(0.0)	3(5.8)	15(28.8)	14(26.9)	2(3.8)	34(65.4)
Very satisfactory	0(0.0)	2(3.8)	0(0.0)	0(0.0)	0(0.0)	2(3.8)
Total	1(1.9)	12(23.1)	18(34.6)	19(36.5)	2(3.8)	52(100)

Source: The output of SPSS (Crosstabulation Analysis) of V177 by V186.

Note: 1. V177 - Quality of the tender and contract documents

2. V186 - Differences in technical contents of bids.

3. Raw chi square = 18.9, Sig. = 0.0414, Cramer's V = 0.422

60% of the 52 plant and construction firms consider both factors to be fairly satisfactory in assessing their tender and contract documents. Thus, V186 (coincidence in technical contents of bids) also plays an important role when assessing the tender and contract documents with V184 (see Table 10.48).

<u>Quality of Tender and Contract Documents and Client's Flexibility</u>

Table 10.50 shows a relationship between V177 (quality of tender and contract documents) and V205 (client's flexibility to introduce changes not defined at the tender stage).

TABLE 10.50

A RELATIONSHIP BETWEEN QUALITY OF TENDER AND CONTRACT DOCUMENTS AND CLIENT'S FLEXIBILITY TO INTRODUCE CHANGES

Unit: number of firms, ( ) %

V205	Client's Flexibility to introduce changes					
V177	Very unsatisfactory	Quite unsatisfactory	Neutral	Quite satisfactory	Very satisfactory	Total
Quite unsatisfactory	1(1.8)	6(10.9)	7(12.7)	3(5.5)	0(0.0)	17(30.9)
Quite satisfactory	1(1.8)	5(9.1)	11(20.0)	14(25.5)	3(5.5)	34(61.8)
Very satisfactory	0(0.0)	0(0.0)	1(1.8)	1(1.8)	2(3.6)	4(7.3)
Total	2(3.6)	11(20.0)	19(34.5)	18(32.7)	5(9.1)	55(100)

Source: The output of SPSS (Crosstabulation Analysis) of V177 by V205.
Note: Raw chi square = 14.97, Sig. = 0.0598, Cramer's V = 0.369

V177 is significantly correlated with V205 at 0.0598 significance level, with a moderate degree of association (Cramer's V = 0.369). 57% of the 55 firms are fairly satisfied with both factors in evaluating their tender and contract documents. This expresses a preference for contractors to fully consider client's flexibility to introduce changes not defined at the tender stage in order that they may be quite satisfied with the quality of tender and contract documents.

Quality of Tender and Contract Documents and Risk Sharing

As can be seen in Table 10.51, V177 is also significantly correlated with V206 (risk sharing between client and contractor) at 0.0085 significance level, with a high degree of association (Cramer's V = 0.464).

TABLE 10.51

A RELATIONSHIP BETWEEN QUALITY OF TENDER AND CONTRACT DOCUMENTS AND RISK SHARING BETWEEN CLIENT AND CONTRACTOR

Unit: number of firms, ( ) %

V206	Risk Sharing between Client and Contractor					
V177	Very unsatisfactory	Quite unsatisfactory	Neutral	Quite satisfactory	Very satisfactory	Total
Quite unsatisfactory	2(3.7)	8(14.8)	3(5.6)	3(5.6)	1(1.9)	17(31.5)
Quite satisfactory	0(0.0)	6(11.1)	16(29.6)	9(16.7)	2(3.7)	33(61.1)
Very satisfactory	0(0.0)	0(0.0)	0(0.0)	2(3.7)	2(3.7)	4(7.4)
Total	2(3.7)	14(25.9)	19(35.2)	14(25.9)	5(9.3)	54(100)

Source: The output of SPSS (Crosstabulation Analysis) of V177 by V206.

Note: 1. V177 - Quality of the tender and contract documents.

2. V206 - Risk sharing between client and contractor.

3. Raw chi square = 23.67, Sig. = 0.0085, Cramer's V = 0.464

In Table 10.51, about 57% of the 54 firms appear to have been fairly satisfied with both factors when assessing their tender and contract documents.

<u>Correction of Bid Prices and Organisational Structure for Design and Construction by Conventional Approach</u>

Table 10.52 shows a relationship between V185 (correction of bid prices for arithmetical errors) and V211 (conventional approach, divided management of design and construction).

It was found that V185 and V211 are highly correlated at 0.05 significance level and there is a fairly strong association between the two variables (Cramer's V = 0.455).

TABLE 10.52

A RELATIONSHIP BETWEEN CORRECTION OF BID PRICES FOR ARITHMETICAL ERRORS AND CONVENTIONAL APPROACH

Unit: number of firms, ( ) %

V211 / V185	Experienced Frequencies ← the most 5	4	3	2	the least → 1	Total
Very unsatisfactory	1(2.8)	1(2.8)	0(0.0)	0(0.0)	1(2.8)	3(8.3)
Quite unsatisfactory	1(2.8)	0(0.0)	0(0.0)	1(2.8)	0(0.0)	2(5.6)
Neutral	12(33.3)	5(13.9)	2(5.6)	0(0.0)	0(0.0)	19(52.8)
Quite satisfactory	6(16.7)	2(5.6)	0(0.0)	0(0.0)	0(0.0)	8(22.2)
Very satisfactory	2(5.6)	1(2.8)	0(0.0)	0(0.0)	1(2.8)	4(11.1)
Total	22(61.1)	9(25.0)	2(5.6)	1(2.8)	2(5.6)	36(100)

Source: The output of SPSS (Crosstabulation Analysis) of V185 by V211.

Note: 1. V185 - Correction of bid prices for arithmetical errors.
2. V211 - Organisational structure for design and construction by conventional approach.
3. Raw chi square = 31.41, Sig. = 0.05, Cramer's V = 0.455

The weighted mean scores of V185 with regard to V211 calculated from the table are as follows:

Correction of bid prices(V185) {
- Very unsatisfactory : 3.33
- Quite unsatisfactory: 3.50
- Neutral : 4.53
- Quite satisfactory : 4.75
- Very satisfactory : 3.75

Thus, the firms which have been quite satisfied with correction of bid prices for arithmetical errors have most frequently selected the conventional approach as the method for the management and execution of design and construction (with a mean score of 4.75).

Price Comparison and Conventional Approach

Table 10.53 shows a relationship between V190 (price comparison between the tender total and the final contract price for evaluating the bids) and V211 (organisational structure for design and construction by conventional approach, namely divided management of design and construction).

TABLE 10.53

A RELATIONSHIP BETWEEN PRICE COMPARISON AND CONVENTIONAL APPROACH

Unit: number of firms, ( ) %

V211	Experienced Frequencies					
	← the most			the least →		
V190	5	4	3	2	1	Total
Very unsatisfactory	1(2.7)	0(0.0)	1(2.7)	0(0.0)	0(0.0)	2(5.4)
Quite unsatisfactory	3(8.1)	1(2.7)	1(2.7)	1(2.7)	0(0.0)	6(16.2)
Neutral	16(43.2)	4(10.8)	0(0.0)	0(0.0)	1(2.7)	21(56.8)
Quite satisfactory	3(8.1)	4(10.8)	0(0.0)	0(0.0)	0(0.0)	7(18.9)
Very satisfactory	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(2.7)	1(2.7)
Total	23(62.2)	9(24.3)	2(5.4)	1(2.7)	2(5.4)	37(100)

Source: The output of SPSS (Crosstabulation Analysis) of V190 by V211.

Note: 1. V190 - Price comparison between tender total and contract price

2. V211 - Conventional approach (divided management of design and construction).

3. Raw chi square = 40.56, Sig. = 0.0042, Cramer's V = 0.517

In Table 10.53, V190 is significantly correlated with V211 at 0.0042 significance level and there is a quite strong association between the two variables (Cramer's V = 0.517).

The mean scores of crosstabulating V190 by V211 are as follows:

Price comparison (V190)	Very unsatisfactory	4.00
	Quite unsatisfactory	4.00
	Neutral	4.62
	Quite satisfactory	4.43
	Very satisfactory	1.00

The weighted mean scores indicate that those firms which have usually selected conventional approach as an organisational structure for design and construction appear to have been less satisfied with price comparisons (with a mean score > 4.00).

Correction of Bid Prices and Requests for Process Management and Technology Guidance

As shown in Table 10.54, V185 (correction of bid prices for arithmetical errors) is significantly correlated with V218 (requests for process management and technology guidance as an incidental condition imposed by importing countries) at 0.0143 significance level. It was found that there is fairly strong association between the two variables (Cramer's V = 0.459).

The mean scores of crosstabulating V185 by V218 are as follows:

Correction of bid price (V185)	Very unsatisfactory	1.50
	Quite unsatisfactory	2.50
	Neutral	3.09
	Quite satisfactory	3.63
	Very satisfactory	4.14

TABLE 10.54

A RELATIONSHIP BETWEEN CORRECTION OF BID PRICE AND REQUESTS FOR PROCESS MANAGEMENT AND TECHNOLOGY GUIDANCE

Unit: number of firms, ( ) %

V218 / V185	Experienced Frequencies ← the most 5	4	3	2	the least → 1	Total
Very unsatisfactory	0(0.0)	0(0.0)	0(0.0)	1(2.4)	1(2.4)	2(4.8)
Quite unsatisfactory	0(0.0)	1(2.4)	0(0.0)	0(0.0)	1(2.4)	2(4.8)
Neutral	2(4.8)	7(16.7)	5(11.9)	9(21.4)	0(0.0)	23(54.8)
Quite satisfactory	2(4.8)	2(4.8)	3(7.1)	1(2.4)	0(0.0)	8(19.0)
Very satisfactory	3(7.1)	3(7.1)	0(0.0)	1(2.4)	0(0.0)	7(16.7)
Total	7(16.7)	13(31.0)	8(19.0)	12(28.6)	2(4.8)	42(100)

Source: The output of SPSS (Crosstabulation Analysis) of V185 by V218.
Note: 1. V185 - Correction of bid price for arithmetical errors.
2. V218 - Requests for process management and technology guidance.
3. Raw chi square = 36.28, Sig. = 0.0143, Cramer's V = 0.459

From the mean scores it is suggested that the more satisfied the firms have been with correction of bid prices for arithmetical errors the more frequently they have experienced requests for process management and technology guidance as an incidental condition imposed by importing countries.

Adequacy of Resources and Method of Construction and Requests for Exports on Deferred-Payment Terms as an Incidental Condition

Table 10.55 shows a relationship between evaluation of bids in terms of adequacy of resources and method of construction (V187) and requests for exports on deferred-payment terms as an incidental condition imposed by importing countries (V220).

It was found that V187 and V220 are significantly correlated at 0.0346 significance level with a fairly strong association between these two variables (Cramer's V = 0.485).

The mean scores of crosstabulating V187 by V220 are as follows:

Quite unsatisfactory	: 3.83	Quite satisfactory	: 3.64
Neutral	: 4.93	Very satisfactory	: 4.00

It can be inferred from the mean scores that neutral firms with regard to adequacy of resources and method of construction have most frequently experienced requests for exports on deferred-payment terms from clients (with a mean score of 4.93).

TABLE 10.55

A RELATIONSHIP BETWEEN ADEQUACY OF RESOURCES AND METHOD OF CONSTRUCTION AND REQUESTS FOR EXPORTS ON DEFERRED-PAYMENT TERMS

Unit: number of firms, ( ) %

V220	Experienced Frequencies						
	← the most				the least →		
V187	6	5	4	3	2	1	Total
Quite unsatisfactory	0(0.0)	3(8.8)	1(2.9)	0(0.0)	2(5.9)	0(0.0)	6(17.6)
Neutral	6(17.6)	4(11.8)	3(8.8)	2(5.9)	0(0.0)	0(0.0)	15(44.1)
Quite satisfactory	1(2.9)	2(5.9)	4(11.8)	2(5.9)	0(0.0)	2(5.9)	11(32.4)
Very satisfactory	0(0.0)	1(2.9)	0(0.0)	1(2.9)	0(0.0)	0(0.0)	2(5.9)
Total	7(20.6)	10(29.4)	8(23.5)	5(14.7)	2(5.9)	2(5.9)	34(100)

Source: The output of SPSS (Crosstabulation Analysis) of V187 by V220.

Note: 1. V187 - Evaluation of bid in terms of adequacy of resources and method of construction.

2. V220 - Requests for exports on deferred-payment terms.

3. Raw chi square = 32.90, Sig. = 0.0346, Cramer's V = 0.485

Lump Sum Contract and the Ability to Meet Project Objectives

As shown in Table 10.56, V199 (lump sum contract in overseas construction contracts) and V203 (the ability to meet project objectives as an element for assessing the type of contract) are very significantly correlated at 0.0001 significance level with a fairly strong association between the two variables (Cramer's V = 0.482).

TABLE 10.56

A RELATIONSHIP BETWEEN LUMP SUM CONTRACT AND THE ABILITY TO MEET PROJECT OBJECTIVES

Unit: number of firms, ( ) %

V203	Experienced Frequencies ← the most		the least →		
V199	4	3	2	1	Total
Quite unsatisfactory	0(0.0)	0(0.0)	1(2.0)	0(0.0)	1(2.0)
Neutral	6(12.2)	1(2.0)	0(0.0)	1(2.0)	8(16.3)
Quite satisfactory	22(44.9)	9(18.4)	0(0.0)	0(0.0)	31(63.3)
Very satisfactory	5(10.2)	1(2.0)	1(2.0)	2(4.1)	9(18.4)
Total	33(67.3)	11(22.4)	2(4.1)	3(6.1)	49(100)

Source: The output of SPSS (Crosstabulation Analysis) of V199 by V203.

Note: 1. V199 - Lump sum contract in overseas construction contracts.
2. V203 - The ability to meet project objectives.
3. Raw chi square = 34.2, Sig. = 0.0001, Cramer's V = 0.482

The mean scores of crosstabulating V199 by V203 are as follows:

The ability to meet project objectives	Quite unsatisfactory	2.00
	Neutral	3.50
	Quite satisfactory	3.71
	Very satisfactory	3.00

It can be inferred from the mean scores that the plant and construction firms which have been quite satisfied with the ability to meet project objectives have most frequently selected the lump sum contract (with a mean score of 3.71).

<u>**Risk Sharing and Significance Level of Risk Contingency in a Lump Sum**</u>

Table 10.57 shows that V206 (risk sharing between client and contractor) is very significantly correlated with V207 (significance level of risk contingency in a lump sum contract) at 0.0000 significance level with a quite strong association (Cramer's V = 0.493).

TABLE 10.57

A RELATIONSHIP BETWEEN RISK SHARING AND SIGNIFICANCE LEVEL OF RISK CONTINGENCY IN A LUMP SUM CONTRACT

Unit: number of firms, ( ) %

V207 / V206	Significance Level of Risk Contingency: Neither	Quite significant	Very significant	Total
Very unsatisfactory(1)	0(0.0)	1(1.9)	1(1.9)	2(3.8)
Quite unsatisfactory(2)	2(3.8)	9(17.3)	3(5.8)	14(26.9)
Neutral(3)	3(5.8)	11(21.2)	4(7.7)	18(34.6)
Quite satisfactory(4)	3(5.8)	4(7.7)	6(11.5)	13(25.0)
Very satisfactory(5)	0(0.0)	2(3.8)	3(5.8)	5(9.6)
Total	8(15.4)	27(51.9)	17(32.7)	52(100.0)

Source: The output of SPSS (Crosstabulation Analysis) of V206 by V207.

Note: 1. V206 - Risk sharing between client and contractor.

2. V207 - Significance of risk contingency in a lump sum contract.

3. Raw chi square = 66.76, Sig. = 0.0000, Cramer's V = 0.493

The mean scores of crosstabulating V206 by V207 are as follows:

	Neither	: 3.13
Significance level of risk contingency {	Quite significant:	2.89
	Very significant	: 3.41

The weighted mean scores indicate that those firms which consider risk contingency in a lump sum contract to be very significant have been fairly satisfied with risk sharing between client and contractor. Therefore, risk contingency in a lump sum contract should have considerable appeal to contractors because of its risk sharing implications. The findings of this survey support those of Perry (see Figure 5.4)

10.3.3 RELATIONSHIPS BETWEEN RISK MANAGEMENT AND CONTRACT STRATEGY

Technical Risk and Duration of Construction

Table 10.58 shows that V121 (technical risk experienced by plant and construction exports firms) and V191 (duration of construction with regard to the contracts which Korean firms have tendered) are very significantly correlated at 0.0025 significance level and there is a high degree of association between the two variables (Cramer's V = 0.492).

The weighted mean scores (calculated from the table) of V191 with regard to V121 are as follows:

	Quite unsatisfactory:	3.67
Satisfaction level in terms of {	Neutral	: 3.08
duration of construction	Quite satisfactory	: 2.81
	Very satisfactory	: 1.00

From the mean scores it appears that the more Korean firms have been satisfied with duration of construction of the contracts for which they have tendered the less frequently they have experienced technical risk in their contracts.

TABLE 10.58

A RELATIONSHIP BETWEEN TECHNICAL RISK AND DURATION OF CONSTRUCTION WITH REGARD TO THE CONTRACTS WHICH KOREAN FIRMS HAVE TENDERED

Unit: number of firms, ( ) %

V121	Experienced Frequencies				
	← the most		the least →		
V191	4	3	2	1	Total
Quite unsatisfactory	2(5.7)	1(2.9)	0(0.0)	0(0.0)	3(8.6)
Neutral	5(14.3)	5(14.3)	4(11.4)	0(0.0)	14(40.0)
Quite satisfactory	4(11.4)	6(17.1)	5(14.3)	1(2.9)	16(45.7)
Very satisfactory	0(0.0)	0(0.0)	0(0.0)	2(5.7)	2(5.7)
Total	11(31.4)	12(34.3)	9(25.7)	3(8.6)	35(100.0)

Source: The output of SPSS (Crosstabulation Analysis) of V121 by V191.

Note: 1. V121 - Technical risk experienced in overseas plant and construction contracts.

2. V191 - Duration of construction with regard to the contracts for which Korean firms have tendered.

3. Raw chi square = 25.4, Sig. = 0.0025, Cramer's V = 0.492

<u>Technical Risk and the Ability to Meet Project Objectives</u>

As shown in Table 10.59, V121 (technical risk) and V203 (the ability to meet project objectives as an element for assessing the contracts selected) are quite significantly correlated at 0.0094 significance level with a moderate degree of association between the two variables (Cramer's V = 0.411).

The weighted mean scores of crosstabulating V121 by V203 are as follows:

	Quite unsatisfactory: 4.50
The ability to meet project objectives	{ Neutral : 4.20
	Quite satisfactory : 3.43
	Very satisfactory : 2.30

Thus, the more firms are satisfied with the ability to meet project objectives when assessing their contracts the less frequently will they experience technical risk in overseas plant and construction contracts.

TABLE 10.59

A RELATIONSHIP BETWEEN TECHNICAL RISK AND THE ABILITY TO MEET PROJECT OBJECTIVES AS AN ELEMENT FOR ASSESSING THE CONTRACTS

Unit: number of firms, ( ) %

V121 / V203	Experienced Frequencies ← the most 5	4	3	the least → 2	1	Total
Quite unsatisfactory	1(1.9)	1(1.9)	0(0.0)	0(0.0)	0(0.0)	2(3.8)
Neutral	6(11.5)	0(0.0)	4(7.7)	0(0.0)	0(0.0)	10(19.2)
Quite satisfactory	5(9.6)	13(25.0)	5(9.6)	4(7.7)	3(5.8)	30(57.7)
Very satisfactory	1(1.9)	0(0.0)	3(5.8)	3(5.8)	3(5.8)	10(19.2)
Total	13(25.0)	14(26.9)	12(23.1)	7(13.5)	6(11.5)	52(100)

Source: The output of SPSS (Crosstabulation Analysis) of V121 by V203.

Note: 1. V121 - Technical risk experienced in overseas plant and construction contracts.

2. V203 - The ability to meet project objectives as an element for assessing the contracts selected.

3. Raw chi square = 26.4, Sig. = 0.0094, Cramer's V = 0.411

Technical Risk and Package Deal or Turnkey Contract

Table 10.60 shows a relationship between V121 (technical risk) and

V215 (package deal or turnkey contract as a method for the management and execution of design and construction).

TABLE 10.60

A RELATIONSHIP BETWEEN TECHNICAL RISK AND PACKAGE DEAL OR TURNKEY CONTRACT AS A METHOD FOR MANAGEMENT AND EXECUTION OF DESIGN AND CONSTRUCTION

Unit: number of firms, ( ) %

V121			Experienced Frequencies					
			← the most			the least →		
V215			5	4	3	2	1	Total
Experienced Frequencies	↑	6	11(23.9)	4(8.7)	1(2.2)	3(6.5)	3(6.5)	22(47.8)
	most	5	1(2.2)	8(17.4)	5(10.9)	1(2.2)	0(0.0)	15(32.6)
		4	0(0.0)	0(0.0)	3(6.5)	2(4.3)	2(4.3)	7(15.2)
	least	3	0(0.0)	0(0.0)	1(2.2)	0(0.0)	0(0.0)	1(2.2)
	↓	1	0(0.0)	0(0.0)	1(2.2)	0(0.0)	0(0.0)	1(2.2)
	Total		12(26.1)	12(26.1)	11(23.9)	6(13.0)	5(10.9)	46(100)

Source: The output of SPSS (Crosstabulation Analysis) of V121 by V215.

Note: 1. V121 - Technical risk experienced in overseas plant and construction contracts.

2. V215 - Package deal or turnkey contract as a method for management and execution of design and construction.

3. Raw chi square = 32.4, Sig. = 0.0088, Cramer's V = 0.420

In Table 10.60, V121 is significantly correlated with V215 at 0.0088 significance level and there is a fairly strong association between the two variables (Cramer's V = 0.420).

The weighted mean scores of crosstabulating V121 by V215 are as follows:

Frequencies experienced of technical risk {
- the most 5: 5.92
- 4: 5.33
- moderate 3: 4.27
- 2: 5.17
- the least 1: 5.20

It was found that firms which have most frequently preferred the package deal or turnkey contract (integrated management of design and construction), with the mean scores > 5.20, have experienced some degree of technical risk.

Financial Risk and Fee Contracting

As can be seen in Table 10.61, V122 (financial risk) is quite significantly correlated with V213 (fee contracting as a method for the management and execution of design and construction) at 0.0073 significance level, with a very strong association (Cramer's V = 0.636).

TABLE 10.61

A RELATIONSHIP BETWEEN FINANCIAL RISK AND FEE CONTRACTING

Unit: number of firms, ( ) %

V213			Experienced Frequencies						
			← the most				the least →		
V122			6	5	4	3	2	1	Total
Experienced Frequencies	↑	4	3(11.5)	0(0.0)	5(19.2)	6(23.1)	3(11.5)	0(0.0)	17(65.4)
	most	3	0(0.0)	0(0.0)	0(0.0)	4(15.4)	1(3.8)	0(0.0)	5(19.2)
	least	2	0(0.0)	1(3.8)	0(0.0)	0(0.0)	1(3.8)	1(3.8)	3(11.5)
	↓	1	0(0.0)	1(3.8)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(3.8)
Total			3(11.5)	2(7.7)	5(19.2)	10(38.5)	5(19.2)	1(3.8)	26(100)

Source: The output of SPSS (Crosstabulation Analysis) of V122 by V213.

Note: 1. V122 - Financial risk
2. V213 - Fee contracting
3. Raw chi square = 31.6, Sig. = 0.0073, Cramer's V = 0.636

It can be inferred from the table that firms which have most frequently experienced financial risk in overseas plant and construction contracts have been biased towards fee contracting (integrated management and construction), the most appropriate method for coping with unforeseen contingencies and emergencies.

<u>Political Risk and Conventional Approach</u>

Table 10.62 shows a relationship between V123 (political risk experienced in overseas plant and construction contracts) and V211 (conventional approach, divided management of design and construction).

TABLE 10.62

A RELATIONSHIP BETWEEN POLITICAL RISK AND CONVENTIONAL APPROACH

Unit: number of firms, ( ) %

V123 / V211			Experienced Frequencies ← the most 5	4	3	2	the least → 1	Total
Experienced Frequencies	↑	5	3(7.9)	9(23.7)	2(5.3)	8(21.1)	0(0.0)	22(57.9)
	most	4	0(0.0)	2(5.3)	3(7.9)	1(2.6)	3(7.9)	9(23.7)
		3	0(0.0)	0(0.0)	1(2.6)	3(7.9)	0(0.0)	4(10.5)
	least	2	0(0.0)	0(0.0)	1(2.6)	0(0.0)	0(0.0)	1(2.6)
	↓	1	1(2.6)	0(0.0)	0(0.0)	1(2.6)	0(0.0)	2(5.3)
	Total		4(10.5)	11(28.9)	7(18.4)	13(34.2)	3(7.9)	38(100)

Source: The output of SPSS (Crosstabulation Analysis) of V123 by V211.

Note: 1. V123 - Political risk

2. V211 - Conventional approach

3. Raw chi square = 27.6, Sig. = 0.035, Cramer's V = 0.426

V123 is significantly correlated with V211 at 0.035 significance level and there is a fairly strong association between the two variables (Cramer's V = 0.426).

The weighted mean scores of crosstabulating V123 by V211 are as follows:

		the most	5: 4.00
			4: 4.82
Frequencies experienced of political risk	{	moderate	3: 3.86
			2: 4.08
		the least	1: 4.00

It was found from the mean scores that firms which have quite frequently experienced political risk have most frequently selected the conventional approach (with a mean score of 4.82).

<u>Construction Risk and Price Inflation of Contracts</u>

As shown in Table 10.63, V125 (construction risk experienced in overseas plant and construction contracts) and V194 (price inflation on the contracts experienced by Korean firms) are significantly correlated at 0.0414 significance level with a fairly strong association between the two variables (Cramer's V = 0.483).

The weighted mean scores of crosstabulating V125 by V194 are as follows:

		Very unsatisfactory	: 4.00
Price inflation in contracts	{	Quite unsatisfactory	: 3.11
		Neutral	: 2.70
		Quite satisfactory	: 2.80

In general, firms which had inflation clauses in their contracts have had less experience of construction risk in overseas plant and construction contracts.

TABLE 10.63

A RELATIONSHIP BETWEEN CONSTRUCTION RISK AND PRICE INFLATION ON THE CONTRACTS EXPERIENCED BY KOREAN PLANT AND CONSTRUCTION FIRMS

Unit: number of firms, ( ) %

V125	Experienced Frequencies					
	← the most			the least →		
V194	5	4	3	2	1	Total
Very unsatisfactory	0(0.0)	4(14.3)	0(0.0)	0(0.0)	0(0.0)	4(14.3)
Quite unsatisfactory	1(3.6)	2(7.1)	3(10.7)	3(10.7)	0(0.0)	9(32.1)
Neutral	0(0.0)	2(7.1)	4(14.3)	3(10.7)	1(3.6)	10(35.7)
Quite satisfactory	0(0.0)	1(3.6)	2(7.1)	2(7.1)	0(0.0)	5(17.9)
Total	1(3.6)	9(32.1)	9(32.1)	8(28.6)	1(3.6)	28(100)

Source: The output of SPSS (Crosstabulation Analysis) of V125 by V194.

Note: 1. V125 - Construction risk

2. V194 - Price inflation on the contracts.

3. Raw chi square = 27.0, Sig. = 0.0414, Cramer's V = 0.483

10.4 SUMMARY AND CONCLUSION

This chapter set out to investigate and interpret the findings of the survey with regard to: (1) comparisons of risk management and contract strategy between Korean and non-Korean firms on the one hand and plant and construction export firms on the other, and (2) relationships between variables associated with risk management and contract strategy.

Country and Industry Comparisons of Risk Management

In comparisons of types of risk, both Korean and non-Korean firms from 11 other countries were found to experience financial risk most frequently and logistical risk least frequently, but Korean firms appeared to have experienced fewer logistical risk and more technical and financial risks than non-Korean firms. This we attributed to the low technological level in Korean firms compared with that of competitors.

Firms from both country groups regard incomplete design and inadequate site investigation as the two most important sources of technical risk. However, Korean firms were more concerned about technological factors (i.e. incomplete design and advanced and new technology) and non-Korean firms about inadequate site investigation. This Korean perspective, again, reflects the relatively low technological level in Korean firms.

In a comparison of financial risk, both country groups regard delay in payment as the most important source of financial risk, and exchange rate fluctuations and inflation as the second and the third important sources of risk. In particular, OPEC countries, which have placed many plant and construction orders, have suffered severe economic difficulties in making payments on time because of the downward trend in oil prices during the 1980s. However, Korean firms are weakly represented among firms which have experienced these sources of financial risk. A major reason for this may be due to financial support (i.e. foreign economic co-operation funds and deferred-payment funds) from the Korean government.

Although plant exporters and construction firms regard delays in payment as the most important source of financial risk, construction firms are far more strongly represented in this area. In addition, construction firms regard inflation - which is considered not to be particularly important by plant exporters - as the second most important source of risk.

Both Korean and non-Korean firms consider customs and import restrictions to be the most important source of political risk. This pattern may be due to a reflection of protectionism in recent years. In addition, non-Korean firms regard the threat of war or revolution and the use of local firms and agents in importing country as much more important sources of political risk than do Korean firms. A major reason for less concern about war or revolution by Korean firms may be their encouragement, via government policy, of new ventures directed towards exporting.

Weather and seasonal influences are the most important source of construction risk among Korean firms and productivity of resources and inappropriate plant among non-Korean firms.

Most Korean and non-Korean firms commonly rely on management perceptions to analyse potential risks, and rarely use formal techniques such as the Monte Carlo principle or utility theory. This is presumably due to management's limited mathematical abilities or a scepticism towards the usefulness of sophisticated analyses. Where analytical techniques are employed Korean firms favour probability analysis and non-Korean firms sensitivity analysis.

It was found that both Korean and non-Korean firms have most frequently resorted to risk reduction and risk transfer to reduce or minimise unexpected cost and time overruns. Both country groups generally transfer their risks from client, contractor, sub-contractor or designer to insurer. Accordingly, the insurer plays an important role in the transfer of risk, and further research with regard to the relationship between contractor or sub-contractor and the insurers associated with the transfer of risk may be required.

Korean and non-Korean firms regard the cost-reimbursable contract as the most appropriate type of contract for avoidance or reduction of risks, but non-Korean firms are more strongly represented in this type of contract. This pattern is due to the features of the cost-reimbursable contract. That is to say, in a fully cost-reimbursable contract, the client carries all the risk since he has to pay for all the actual cost of construction. Thus, there is no financial incentive for the contractor to mitigate the risk or improve his efficiency.

It was found that both Korean and non-Korean firms have most frequently experienced risks in the Middle-East, followed by South-East Asia and Africa, the regions where their exporting has mainly occurred. Korean firms are more strongly represented in the Middle-East (and non-Korean firms in South-East Asia and Africa), largely due to the concentration of their exports in these regions (see Table 10.18) and to decreased oil prices in recent years. In addition, non-Korean firms have experienced some risks in Latin America, a region in which Korean firms have hardly ever experienced risks. The threat to the former may have been caused by unstable economic and political conditions resulting from a high volume of foreign debt.

Country and Industry Comparison of Contract Strategy

In the methods for the management and execution of design and construction, both Korean and non-Korean firms are seen to favour the conventional method and the package deal or turnkey contract and to be averse to the direct labour force account. The conventional method is more frequent among non-Korean firms and the package deal or turnkey contract among Korean firms. Korean firms seldom utilise management contracting, a technique which is particularly suitable for large and complex projects, whereas non-Korean firms frequently utilise this method. The low utilisation by Korean firms may be due to their inability to bid successfully for large projects which require a complicated high technology as a result of their weak engineering and design ability. It was found that plant exporters have mostly tendered successfully under a package deal or turnkey contract arrangement and construction firms under the conventional method. The contract mode favoured by plant firms may be due to the higher technological content of their activities.

In a comparison of the types of contract selected by Korean firms in overseas plant contracts, the lump sum contract, which is usually let by competitive tender, has been most frequently selected. This is probably due to the feature of the lump sum contract, which imposes a maximum incentive and risk contingency sum on the contractor in comparison to a cost-reimbursable or target cost contract. To become the lowest bidder in lump sum contracts Korean firms may seriously underestimate contract risks.

With regard to the types of contract in overseas construction contracts, the research has shown that both country groups favour the lump sum contract and have least regard for the target cost contract. The attitudinal difference between the two country groups appeared significantly in the cost-reimbursable contract, with non-Korean firms having more experience of this type of contract, which is commonly employed in projects that involve technical innovation and multi-contract complexity. In a comparison of the two industry groups, plant exporters have mostly associated with lump sum contracts and construction firms with both lump sum and admeasurement.

It was found that when assessing the type of contract according to a) the ability to meet project objectives; b) contractor's incentive; c) client's flexibility; and d) contractor's risk allocation, non-Korean firms are generally seen to be more satisfied with whatever methods they use for contract evaluation. In particular, non-Korean firms express a much greater degree of satisfaction with their ability to meet their project objectives. Korean firms are fairly dissatisfied with contractor's risk allocation, implying, again, that they probably pay insufficient attention to risk contingency fund estimates for inclusion in the tender price. In the industry comparison, construction firms are much more satisfied with the contractor's incentive compared with plant exporters.

In lump sum contracts, non-Korean firms generally consider the risk contingency to be more significant than do Korean firms. In other words, Korean firms appear to seriously underestimate the effect of risks encountered in a lump sum contract in order to become competitive bidders. This may occur because they compensate their weak points in technological competition with relatively low tender prices. Of the two industry groups, construction firms appear to be more aware of contract risks when they compute their risk contingency fund compared with plant exporters. This may be attributable to the tendency for the construction industry to cover a wider range of sources of risk.

It was found that in lump sum contracts non-Korean firms have more frequently experienced an adjustment of their contract price than have Korean firms. This suggests that Korean firms should be more prepared to press for adjustments to the contract price whenever they suffer contract changes initiated by their client or a cost escalation in order not to incur losses after finishing their projects. Construction firms have more frequently experienced an adjustment to the contract price than have plant exporters due to a cost escalation in a lump sum contract.

In tender preparation, non-Korean firms have carried out more competent estimating work than Korean firms in support of their tenders, pointing to a major professional weakness in Korean management. It also appears that non-Korean firms are relatively more satisfied with the quality of the tender and contract document of their firms and presumably prepare more accurate and concise contract documents than Korean firms, including the clarification of areas of responsibility and the unambiguous allocation of risks.

The research has shown that both Korean and non-Korean firms have most frequently experienced competitive tendering among the various tendering procedures, followed by negotiated tendering. Clients undoubtedly prefer competitive or negotiated tendering to other tendering procedures when placing an order because this allows them to select a restricted number of bidders or to negotiate with a single reputable and reliable contractor whom they know. Accordingly, Korean firms must raise the level of their technological competence before they can expect to enjoy the benefits of such recognition.

It was found that in tender analysis involving financially explicit variables, non-Korean firms have more frequently experienced considerable differences between their tender total and the final contract price, and also more delays in payments due from clients than have Korean firms. This may be explained by the tendency of Korean firms to tender low bids.

Korean firms are generally satisfied with the duration of construction and the magnitude and timing of advance payments with which to mobilise equipment and manpower, but less satisfied with the expected pattern of payment for measured work and with the impact of price inflation, but sometimes failing to receive full compensation for price inflation (even if a contract price adjustment clause is included). Nor have they always received in time the expected payment for measured work in accordance with the schedule of payments falling due in line with the progress of construction.

In both country and industry groups the most frequently experienced incidental conditions of contract imposed by importing countries are requests for project financing to service the contract and for process management and technology guidance, indicating that such requests have influenced successful bids by both Korean and non-Korean firms. In effect, successful bidders usually state their intentions to make a grant of supplier's credit to service the project financing and to give process management and technology guidance for importing countries. As a result, such facilities constitute an important competitive strategy. Of the two country groups, non-Korean firms, which enjoy both an abundant supply of finance and a high level of technology relative to Korean firms, have more frequently experienced these two incidental conditions and have been more significantly influenced by these conditions compared with Korean firms, which have experienced request for long-term after-sales service much more than non-Korean firms. In contrast, small and medium-sized Korean firms tend to be excluded from participation in large projects on account of their inability to meet such requests. Of the two industry groups, plant exporters have more frequently experienced incidental conditions (in particular, requests for long-term after-sales service and for unreasonable deferred payment terms) than have construction firms, perhaps because the plant industry requires a high level of technology relative to the construction industry.

Relationships between Variables Associated with Risk Management and Contract Strategy

It was found that both Korean and non-Korean firms prefer the cost-reimbursable contract to the lump sum when they wish to avoid or reduce contract risks (especially technical risks), and usually transfer their risks from client, contractor, sub-contractor or designer to insurer, inferring that the insurer plays an important role as a risk transferee in the cost-reimbursable contract.

The quality of tender and contract documents is significantly correlated with the following four variables: a) whether the bids are fully responsive to the tender documents; b) differences in the technical content of bids; c) client's flexibility to introduce changes not defined at the tender stage; and d) risk sharing between client and contractor, with a fairly strong association.

Firms which expressed satisfaction with the correction of bid prices for arithmetical errors have most frequently selected the conventional method (divided management of design and construction) for the management and execution of design and construction. However, those firms which have usually selected conventional method appear to have been less satisfied with price comparisons between the tender total and the final contract price. This may be due to a divided management of design and construction.

It was found that the more satisfied the firms have been with correction of bid prices for arithmetical errors, the more frequently they have experienced requests for process management and technology guidance as an incidental condition imposed by importing countries. It was also found that the lump sum contract has an important effect upon the ability to meet project objectives. Indeed, risk contingency in a lump sum contract should have considerable appeal to contractors because of its risk sharing implications between client and contractor.

The more Korean firms have been satisfied with the duration of construction of the contracts for which they have tendered, the less frequently they have experienced technical risk in their contracts. And the more firms were satisfied with the ability to meet project objectives in assessing their contracts, the less frequently they experienced technical risk, indicating a significant correlation between these two variables.

It was found that there are fairly strong relationships between the types of risk and organisational structures for design and construction. They are as follows: (a) the firms which have most frequently preferred the package deal or turnkey contract have experienced some degree of technical risk; (b) the firms which have most frequently experienced financial risk have been biased towards fee contracting, the most appropriate method for coping with unforeseen contingencies and emergencies; and (c) the firms which have quite frequently experienced political risk have most frequently selected the conventional approach.

Finally, the research has shown that, in general, firms which had inflation clauses in their contracts had less experience of construction risk in overseas plant and construction contracts.

NOTES

1. Calculation was based on multiplying the frequency count of each scale by weights given to these values: from 5 (the most frequent) to 1 (the least frequent).

2. Calculation was based on multiplying the frequency count of each value by weights given to these values: from 5 (the most important) to 1 (the least important).

3. Calculation was based on multiplying the frequency count of each value by weights given to these values: from 7 (the most important) to 1 (the least important).

4. Calculation was based on multiplying the frequency count of each value by weights given to these values: from 7 (the most frequent) to 1 (the least frequent).

5. Engineering News Record, July 21, 19, 18, 17 and 16 from 1983 to 1987, respectively.

6. Calculation was based on multiplying the frequency count of each value by weights given to these values: from 6 (the most frequent) to 1 (the least frequent).

7. Calculation was based on multiplying the frequency count of each value by weights given to these values: from 4 (the most frequent) to 1 (the least frequent).

8. Calculation was based on multiplying the frequency count of each value by weights given to these values: 5(very satisfactory); 4 (quite satisfactory); 3 (neutral); 2 (quite unsatisfactory); and 1 (very unsatisfactory).

9. Calculation was based on multiplying the frequency count of each value by weights given to these values: from 5 (very significant) to 1 (very insignificant).

10. Calculation was based on multiplying the frequency count of each value by weights given to these values: 5 (always); 4 (often); 3 (sometimes); 2 (seldom); and 1 (never).

CHAPTER 11

INTERNATIONAL COMPETITION IN THE PLANT AND CONSTRUCTION INDUSTRY

This chapter presents the results of an empirical enquiry into the perceptions of Korean and non-Korean firms of the competitive power of Korean plant and construction exporters. This is followed by a comparison of the international competitive power of plant exports according to the concept of "revealed" comparative advantage.

To determine attitudinal differences with regard to education systems, technology transfer and competitive advantage, including the eclectic theory advanced by Dunning, discriminant analysis is employed a) for country comparisons between Korea and non-Korean countries (already identified in chapter 8 and 10) and b) for an industry comparison between plant exporters and construction firms. First, however, the concept of international competitiveness is briefly introduced.

The chapter has seven sections:

1. The concept of international competitiveness.
2. Estimating the competitive power of Korean plant and construction exports.
3. A comparison of the international competitive power of plant exports (by "revealed" comparative advantage).
4. Attitudes of plant exporters and construction firms towards the education system.
5. Technology transfer.
6. Competitive advantage.
7. Summary and conclusions.

11.1 THE CONCEPT OF INTERNATIONAL COMPETITIVENESS

The concept of international competitiveness, involving comparisons of salient economic features that can help explain international trade trends, is in common use in the analysis of a country's macroeconomic performance. The interpretation of performance often involves qualitative factors (or factors that do not lend themselves readily to quantification) such as the capacity for technological innovation, degree of product specialisation, the quality of the products involved, and the value of after-sales service.

With the continued growth of international trade and foreign investment, international competition has become one of the most important issues facing firms and governments. The most significant strategic problem for a growing number of firms is learning to compete internationally in an environment which subjects firms to home and host government incentives, pressures and constraints.

According to a recent survey of company records[1], fierce competition and smaller project sizes have contributed to smaller profit margins in the export construction market in recent years. In consequence, contractors were less inclined than usual to discuss profits. Only a fifth of the top 250 international contractors reported their net profit margins in 1985, compared to a third in 1984, and average foreign profit showed a fall to 5.3% of revenues from 7.3% in 1984.

Porter (1986) has suggested a number of reasons for the growth of international competitiveness since World War Two as follows:

1. Growing similarity of countries: in infrastructure, distribution channels and marketing.

2. Fluid global capital markets. National capital markets are merging into a global capital market, characterised by large flows of funds between countries.
3. Falling tariff barriers. Successive rounds of bilateral and multilateral agreements have lowered tariff levels markedly since World War Two.
4. Technological restructuring. Industry after industry has been significantly affected by technological revolutions that are reshaping competition, such as in microelectronics, information systems and advanced new materials.
5. Integrating role of technology. Technology is not only reshaping industries but contributing to bringing countries together. Electronics and new materials are working singly and together to yield more compact, lighter products that are less costly to ship. Increasing ease of communication and data transfer are creating opportunities to link operations in different countries, allowing firms to integrate and coordinate far-flung activities in more and more complex ways.
6. New global competitors. All these forces have triggered shifts, sometimes dramatic ones, in the international competitive position of countries, and countries from East Asia have become international competitors in the space of a decade.

While the currents of change have led to growing international competition, some important cross-currents have made the pattern of international competition different and more complex since the 1960s and early 1970s. These include:

1. Slowing rates of economic growth. Beginning notably with the first oil crisis, firms in many industries have been faced with slow and

even negative growth and intense competitive rivalry. Less opportunity at home has made success in international markets particularly important for firms.

2. <u>Eroding types of comparative advantage</u>. Traditional sources of comparative advantage, such as labour costs, natural resources, and technology access, are receding in importance. New technologies are making direct labour costs a smaller and smaller fraction of the total costs, and many nations with low labour costs have gained the ability to produce advanced goods because technology diffuses rapidly among countries through licences, engineering companies and multinational companies themselves.
3. <u>New forms of protectionism</u>. While the post-war trend toward free trade has brought tariffs down and spawned regional trade pacts, there has emerged a new wave of protectionism based on quotas and voluntary agreements.
4. <u>New types of government inducement</u>. Another manifestation of the rising intensity of international competition is the growing rivalry among governments to attract foreign investment. Governments are also increasingly aggressive in assisting their domestic firms to compete overseas.
5. <u>Proliferating coalitions among firms from different countries</u>. Firms are seeking to combine strengths and overcome weakness through collaboration that is broader and deeper than the marketing joint ventures and technology licences of the past. Governments often force or encourage such collaboration in preference to merger or to allowing foreign firms to prevail in their country (Porter 1986).

Changes such as these are making more and more industries global in competitive scope, but in increasingly complex ways. They require that firms adopt a global approach to strategy and to managing every functional area.

Ideally, measures of competitiveness should satisfy three basic criteria: a) they should include all the sectors exposed to competition, i.e. represent all goods, traded or tradeable, that are subject to competition; b) they should cover all the markets open to competition; and c) they should be constructed from data that are fully comparable internationally. Actually, none of the indicators that are available satisfy these three criteria. Data and other limitations result in compromises with available data at every stage, so that any measure of competitiveness is in fact only a rough approximation of the ideal.

A number of different variables are used in practice for constructing competitiveness indicators. These include producer or wholesale prices, consumer prices, GDP (Gross Domestic Product) deflators, export prices, and unit labour costs and exchange rates (Durand and Giorno, 1987), all of which have their strengths and weaknesses.

Indices of producer prices of manufactures that are tradeable on both home and foreign markets vary in quality across countries and their movements tend to be heavily influenced by changes in the prices of intermediate inputs. In particular, their lack of homogeneity in terms of weighting and coverage makes them unreliable but they are sometimes used for measuring competitiveness.

Relative indicators which originate from consumer prices are often used instead because consumer price statistics are easily available for a number of countries, but these have the weakness of including a whole range of goods and services that are not subject to international competition. Furthermore, their components and method of calculation and weighting also vary from country to country. Relative indicators based on GDP deflators are sometimes used since their statistics are readily available for many countries.

Average export unit value indices, which are comparable for a large number of countries, are the most frequently used. Their specific advantage is that the data relate to goods recorded by the customs authorities as having left the national boundary and are representative of goods actually competing on foreign markets. However, these indices do not include potentially exportable goods, which can be a problem because account may not be taken of possible losses of competitiveness with regard to goods which, while potentially exportable, have not been exported so far since they are too highly priced. Hence, these unit values do not consider the effects on competitiveness of changes in profitability in the exporting industries. Another weakness is that the definitions of these indices differ from country to country, particularly as regards the degree of disaggregation.

Among cost variables, it is usual to take indices of unit labour costs rather than total costs because of problems of international consistency of data. Labour costs are clearly only one part of total costs, but broader cost measures are difficult to construct and may not produce superior information. Unit labour costs in manufacturing, rather than the economy as a whole, are generally used as being more representative of unit labour costs in the competitive sector, where costs are often lower than the average for the whole economy.

Costs and prices require to be converted to a common reference currency (generally the US dollar) for international comparison. The competitiveness indicated by a price or cost difference is then measured by a real effective exchange rate. The nominal exchange rate is only one factor in estimating competitiveness. The other is the nominal relative price or cost, which is less often calculated. Fluctuations in the nominal exchange rate, combined with the inflexibility of wages expressed in local currency, can give rise to changes in relative (normalised) unit labour costs expressed in a common currency. For example, the 17.0% depreciation of sterling during 1976 was associated with an initial improvement in cost competitiveness: during this period normalised unit labour costs in UK manufacturing fell by 15.0% relative to those of her competitors. Conversely, the 22.0% appreciation of sterling during 1979 and 1980 was associated with a 47.0% rise in nominal unit labour costs in UK manufacturing relative to those of her competitors (Bank of England, 1982). In the case of Korea, the Korean currency (won) has appreciated 21.2% against the U.S. dollar between February 1987 and February 1988. Thus, Korean businessmen, concerned that their goods will lose their competitiveness in overseas markets if the won's exchange rate drops below the 700-won level, are revising their business strategy to resist the erosion of their international competitive edge. One strategy has been to diversify import and export resources in favour of high value-added products (Korea Newsreview, February 20, 27, April 9, 1988).

Finally, the role of price-competitiveness indicators is to act as a yardstick of price-competition between producers located in different countries. It is necessary, in constructing such indicators, to specify clearly the particular aspect of competition, and to define both the countries relative to which competitiveness is to be measured and the markets in which competition operates. Thus, the measurement of a country's competitiveness will be affected both by the location and the structure of the markets for which it is calculated. It is important to be aware that any specific indicator may be connected with only one particular aspect of trade performance, and the indicator used should depend on the question being asked.

There have been some gradual but significant changes in the pattern of international competition since the late 1970s. Foreign direct investment has been growing more rapidly and moving in new directions, whereas growth in trade has slowed due to a sharp rise in protectionism in recent years.

Even if segmentation of product needs within countries appears to be continuing, this is also true of the degree of homogenisation among countries. Accordingly, consumer packaged goods are becoming globalised. There are also signs of globalisation in some service industries because of the introduction of information technology which creates scale economies.

Flexible manufacturing allows the production of multiple varieties to serve different countries and this may encourage a new movement toward globalisation in industries in which product differences among countries have remained significant. The declining labour content in many industries due to automation is another important change. Falling labour content also suggests that more foreign investment will flow to developed countries to secure market access instead of low-wage countries. As a result, the incentive to invest in low-wage countries such as South Korea and Singapore is being reduced.

Transport costs also appear to be declining since smaller, lighter products and components may keep some downward pressure on transport costs through innovations such as containerisation, bulk ships and larger aircraft. Communication costs are dropping sharply, driven by considerable advances in management information systems and telecommunication technology. Engineers in different countries can communicate via computer screens and marketing systems and business practices can continue to homogenise, facilitating the coordination of business activities in different countries. Increasing numbers of multinational firms are begetting globalisation by their suppliers. There is also a rapid rise in the computerisation of manufacturing as well as other industries.

Under these circumstances, fierce competition among countries is expected to continue, and successful international competitors in the future will be those who can search for competitive advantages and overcome the organisational barriers to exploit them.

11.2 ESTIMATING THE COMPETITIVE POWER OF KOREAN PLANT AND CONSTRUCTION EXPORTS

This section will present the findings of empirical estimates of the international competitive power of Korean plant and construction exports derived from a survey of both Korean and non-Korean firms. The research has attempted to separate price from non-price competitive factors affecting the international competitive power of Korean and selected competitors.

In general, price competitiveness is calculated by a relative price comparison of domestic and international prices, a comparison which depends on the method of calculation. A particular problem, for example, concerns the similarity and comparability of products by type and quality. Thus, any measure of price competitiveness can be regarded as a tentative one. In the case of non-price competitiveness, there are also problems of measurement and comparability. With such constraints in mind, this research survey attempts to analyse competitiveness by the application of a seven-point bipolar scale questionnaire.

In this section, differences between industry groups (plant and construction) are compared through a stepwise discriminant analysis of rankings by Korean firms of the factors affecting competitive strength.

11.2.1 ESTIMATION BY KOREAN FIRMS

In this sub-section, estimates by Korean firms of Korean international competitive power is compared with eight other countries in plant and construction export markets. This is followed by an industry comparison with four developed and one newly industrialised country.

International Comparisons of Korean Competitive Power in Plant and Construction Exports

Table 11.1 and Graph 11.1 show the comparisons of Korean international competitive power (based on the sample of Korean firms surveyed) in plant and construction exports with that of eight other countries. The rankings by country, including price and non-price factors, show that overall Japan has the relativeley strongest competitive power (3.719), closely matched by West Germany (3.721) and the United States (3.806). Korea compares unfavourably with these advanced industrial nations, but has advantages over Taiwan (4.625) and Brazil (5.189).

The leadership demonstrated by the developed countries, such as the United States, Japan and West Germany, stems from significant advantages compared with other countries with respect to technology, design and information collecting ability, three core areas of industrial plant installation and overseas construction exports. Such advantages have a direct bearing on non-price competitiveness in particular. However, the developed countries demonstrate weak price competitiveness and a fairly weak competitive power in terms of date of delivery as compared with Korea. Korea has a comparative disadvantage in technology (with a weighted mean score < 2.88), design ability (< 2.91) and information collecting ability (< 3.11), but enjoys a comparative advantage with respect to price (> 5.3) and date of delivery (> 4.7) compared with the developed countries such as the United States, Japan and West Germany.

The international competitive power of Korean plant exporters and construction firms relative to their foreign competitors are portrayed,

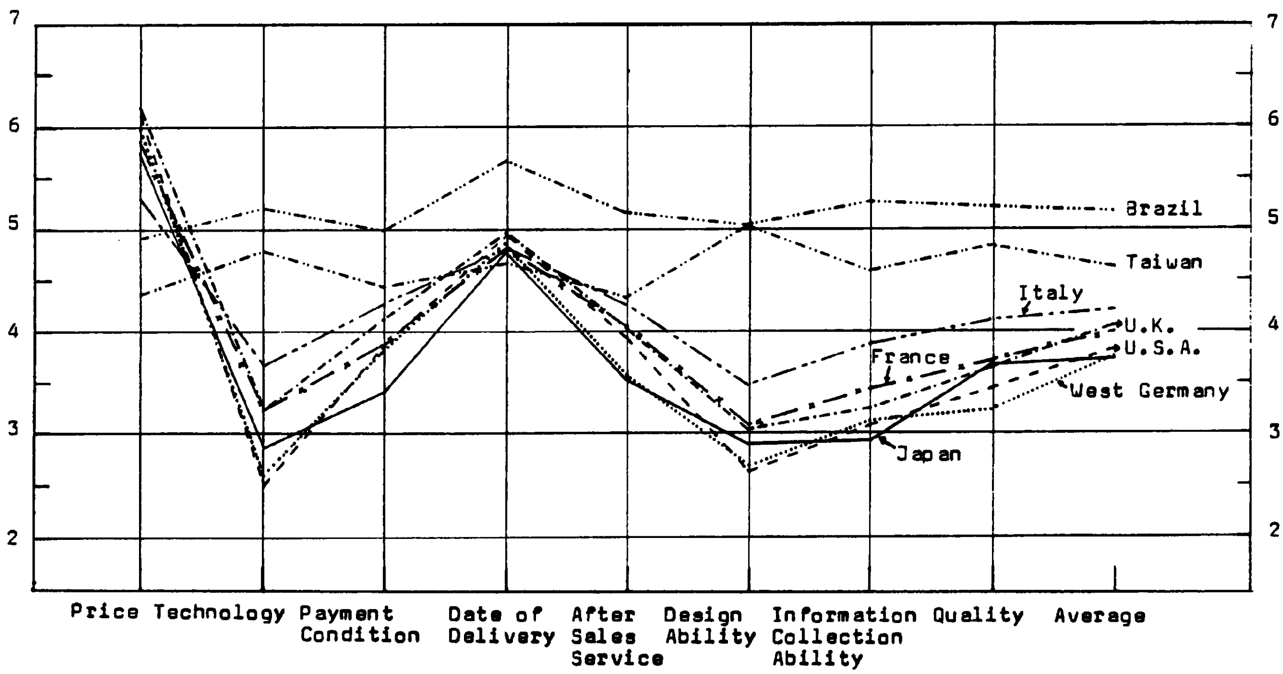
TABLE 11.1

KOREAN INTERNATIONAL COMPETITIVE POWER ESTIMATED BY KOREAN FIRMS.

Factor \ Country	Japan	U.S.A.	West Germany	U.K.	France	Italy	Taiwan	Brazil	Average
Price	5.756	6.125	6.000	6.179	5.872	5.308	4.385	4.939	5.571
Technology	2.878	2.500	2.513	3.231	3.231	3.667	4.769	5.212	3.500
Payment Condition	3.341	3.850	3.821	4.128	3.872	4.282	4.436	5.000	4.091
Date of Delivery	4.780	4.950	4.872	4.974	4.821	4.821	4.667	5.667	4.944
After Sales Servive	3.512	3.925	3.564	4.026	4.026	4.256	4.308	5.182	4.100
Design Ability	2.902	2.625	2.667	3.026	3.051	3.462	5.026	5.030	3.474
Information Collection Ability	2.927	3.050	3.103	3.231	3.436	3.872	4.590	5.273	3.685
Quality	3.659	3.425	3.231	3.641	3.692	4.103	4.821	5.212	3.973
Average	3.719	3.806	3.721	4.055	4.000	4.221	4.625	5.189	4.167

GRAPH 11.1

KOREAN INTERNATIONAL COMPETITIVE POWER ESTIMATED BY KOREAN FIRMS



Source: The output of SPSS (Discriminant Analysis) for question No. 44 - 51. Calculation of the above figures was based on multiplying the frequency count of each scale by weights given to these values: from 7 (extremely strong) to 1 (extremely weak).

Note: The sample of Korean firms consists of 41 comparisons with Japan, 40 with the U.S.A., 33 with Brazil and 39 with the five other countries.

respectively, in Tables 11.2 and 11.3 (and Graphs 11.2 and 11.3). Compared with developed country firms, Korean plant and construction firms have a relatively weak competitive power in technology, payment condition, design and information collecting ability and quality, and a relatively strong competitive power in price and date of delivery. In the case of after-sales service, plant exporters have a relatively weak competitive power. In contrast, construction firms have a moderately strong competitive power compared with advanced countries, with the exception of West Germany (3.688).

The rankings show that Japan has the strongest competitive power among plant exporters (3.573), followed by West Germany (3.788), the United States (3.897), France (3.955) and the United Kingdom (4.057). In contrast, the construction industries rankings show that West Germany has the relatively strongest competitive power (3.625), followed by the United States (3.684), Japan (3.926), the U.K. (4.052) and France (4.059). Overall, Japan and West Germany emerge as the most competitive countries in the world plant markets and West Germany and the United States in the world construction markets.

An Industry Comparison With Regard To Korean International Competitive Power By Country In Plant and Construction Exports

Table 11.4 to 11.8 show the attitudinal differences between the two industry groups with regard to Korean international competitive power compared with Japan, the USA, West Germany, the UK and Taiwan.

In Table 11.4, five variables significantly discriminate between the two industry groups in the comparisons with Japan. The most signi-picantly discriminated variable is V263, followed by V262 and V266.

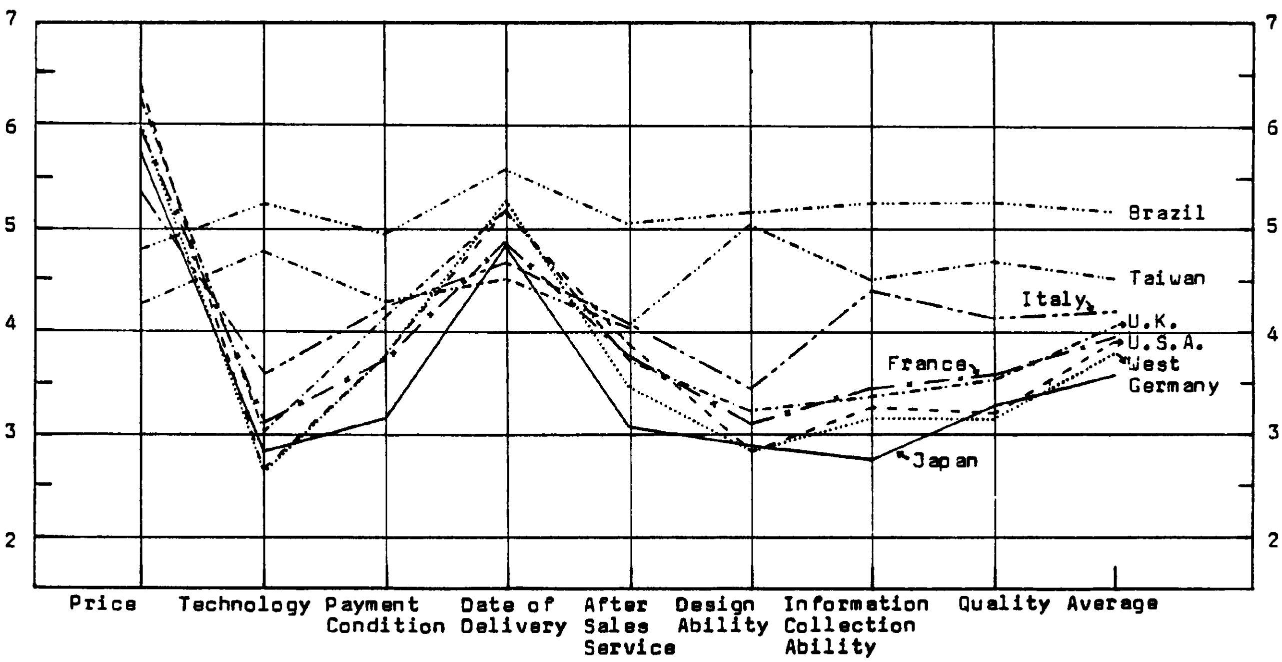
TABLE 11.2

KOREAN INTERNATIONAL COMPETITIVE POWER ESTIMATED BY KOREAN PLANT EXPORTERS

Factor \ Country	Japan	U.S.A.	West Germany	U.K.	France	Italy	Taiwan	Brazil	Average
Price	5.750	6.391 ●	6.000	6.227	5.955	5.409	4.261	4.800	5.599
Technology	2.833 ●	2.652 ●	2.609	3.045 ●	3.136	3.591	4.783 ●	5.250	3.487
Payment Condition	3.167	3.783	3.783	4.136	3.727	4.227	4.304 ●	4.950	4.010
Date of Delivery	4.833 ●	5.174	5.261 ●	5.182 ●	4.864 ●	4.727	4.522 ●	5.650	5.027
After-sales Service	3.083 ●	3.870 ●	3.478 ●	3.727	3.773 ●	4.091 ●	4.043 ●	5.050	3.889
Design Ability	2.875 ●	2.826	2.826	3.227 ●	3.136	3.455	5.043 ●	5.150	3.567
Information Collection Ability	2.750	3.261 ●	3.174	3.364	3.455	4.405 ●	4.522 ●	5.250	3.773
Quality	3.292 ●	3.217 ●	3.174	3.545 ●	3.591	4.136	4.696	5.250	3.863
Average	3.573	3.897	3.788	4.057	3.955	4.210	4.522	5.169	4.146

GRAPH 11.2

KOREAN INTERNATIONAL COMPETITIVE POWER ESTIMATED BY KOREAN PLANT EXPORTERS



Source: Table 11.1 and Graph 11.1.

Note: ● represents significantly discriminated variables.

The sample of Korean plant exporters consists of 24 comparisons with Japan, 23 with the U.S.A., West Germany and Taiwan, 20 with Brazil and 22 with the three other countries.

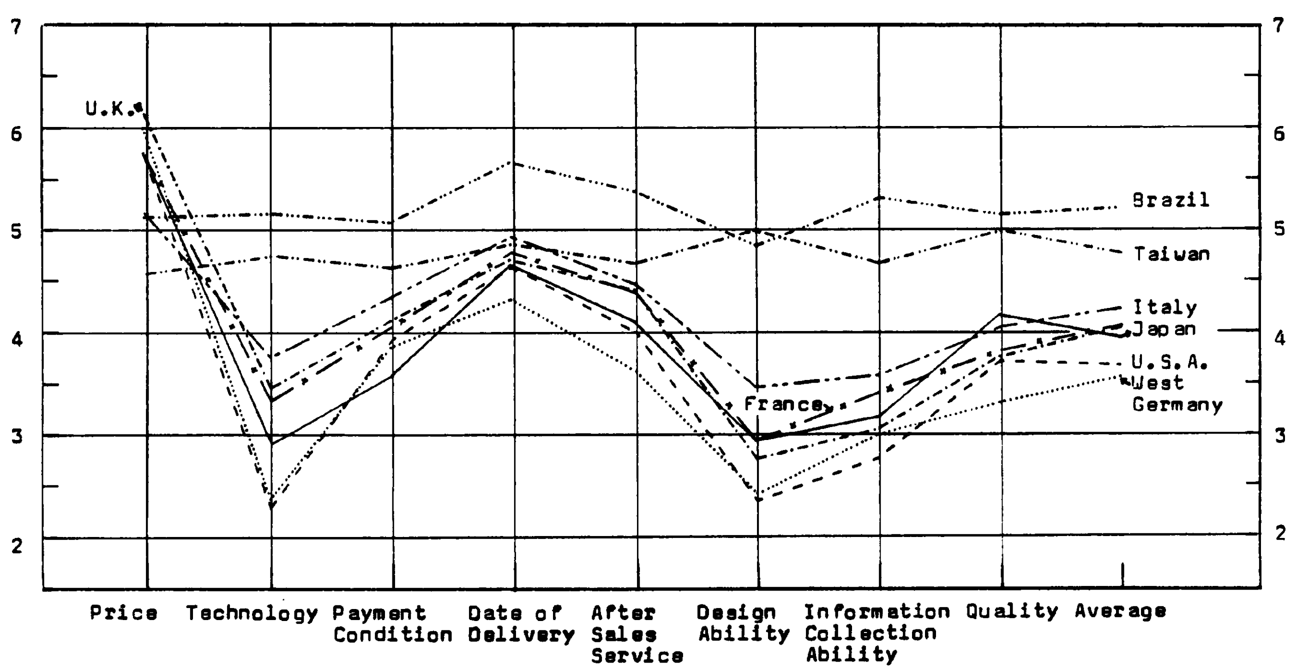
TABLE 11.3

KOREAN INTERNATIONAL COMPETITIVE POWER ESTIMATED BY KOREAN CONSTRUCTION FIRMS

Factor \ Country	Japan	U.S.A.	West Germany	U.K.	France	Italy	Taiwan	Brazil	Average
Price	5.765	5.765●	6.000	6.118	5.765	5.176	4.563	5.154	5.538
Technology	2.941●	2.294●	2.375	3.471●	3.353	3.765	4.750●	5.154	3.513
Payment Condition	3.588	3.941	3.875	4.118	4.059	4.353	4.625●	5.077	4.205
Date of Delivery	4.706●	4.647	4.313●	4.706●	4.765●	4.941	4.875●	5.692	4.831
After-sales Service	4.118●	4.000●	3.688●	4.412	4.353●	4.471●	4.688●	5.385	4.389
Design Ability	2.941●	2.353	2.438	2.765●	2.941	3.471	5.000●	4.846	3.344
Information Collection Ability	3.176	2.765●	3.000	3.059	3.412	3.647●	4.688●	5.308	3.632
Quality	4.176●	3.706●	3.313	3.765●	3.824	4.059	5.000	5.154	4.125
Average	3.926	3.684	3.625	4.052	4.059	4.235	4.774	5.221	4.197

GRAPH 11.3

KOREAN INTERNATIONAL COMPETITIVE POWER ESTIMATED BY KOREAN CONSTRUCTION FIRMS



Source: Table 11.1 and Graph 11.1.
Note: ● represents significantly discriminated variables.
The sample of Korean construction firms consists of 16 comparisons with West Germany and Taiwan, 13 with Brazil and 17 with the five other countries.

Both industry groups regard price and date of delivery as the most favourable Korean competitive factors, and technology and design ability as the two most unfavourable factors. Korean plant exporters are more concerned about their ability to compete technologically (i.e. technology, design ability and quality) than are Korean construction firms.

TABLE 11.4

INTERNATIONAL COMPETITIVE POWER OF KOREA RELATIVE TO JAPAN

Variable Number	Factors	Weighted Mean Scores: Plant (a)	Construction (b)	Total
V259	Price	5.750(1)	5.765(1)	5.756(1)
* V260	Technology	2.833(7)	2.941(7)	2.878(7)
V261	Payment condition	3.167(4)	3.588(5)	3.341(5)
* V262	Date of delivery	4.833(2)	4.706(2)	4.780(2)
* V263	After-sales service	3.083(5)	4.118(4)	3.512(4)
* V264	Design ability	2.875(6)	2.941(7)	2.902(8)
V265	Information collection ability	2.750(8)	3.176(6)	2.927(6)
* V266	Quality	3.292(3)	4.176(3)	3.659(3)
	Average	3.573	3.926	3.719

Source: The output of SPSS (Discriminant Analysis) for question No. 44. See Table 11.1.

Note: 1. * represents significantly discriminated variables. Eigenvalue, canonical correlation, Wilks lambda and significance are 0.444, 0.554, 0.693 and 0.020, respectively. Percent of grouped cases correctly classified: 73.2%.
2. (a) 24 companies (b) 17 companies.
3. Figures in brackets indicate ranking according to competitive power.

The selected discriminant variables have a moderate discriminant power on the evidence of the canonical correlation coefficient (0.554). At 0.020 significance level, 30 (73.2%) of 41 observations are correctly classified.

Table 11.5 shows that five variables significantly discriminate between the two industry groups in the comparisons with the United States. The most significantly discriminated variable is V267, followed by V274 and V273. As with Japan, both industry groups regard price and date of delivery as the major Korean competitive advantages, particularly for plant exporters. Both industry groups consider technology and design ability to be the two most serious disadvantages. But Korean construction firms appear to be more concerned about their technological strengths compared with plant exporters, in contrast to the Japan comparisons which showed plant exporters to be more concerned about technology.

TABLE 11.5

INTERNATIONAL COMPETITIVE POWER OF KOREA RELATIVE TO THE U.S.A.

Variable Number	Factors	Weighted Mean Scores: Plant (a)	Construction (b)	Total
* V267	Price	6.391(1)	5.765(1)	6.125(1)
* V268	Technology	2.652(8)	2.294(8)	2.500(8)
V269	Payment condition	3.783(4)	3.941(4)	3.850(4)
V270	Date of delivery	5.174(2)	4.647(2)	4.950(2)
* V271	After-sales service	3.870(3)	4.000(3)	3.925(3)
V272	Design ability	2.826(7)	2.353(7)	2.625(7)
* V273	Information collection ability	3.261(5)	2.765(6)	3.050(6)
* V274	Quality	3.217(6)	3.706(5)	3.425(5)
	Average	3.897	3.684	3.806

Source: The output of SPSS (Discriminant Analysis) for question No. 45. See Table 11.1.

Note: 1. * represents significantly discriminated variables. Eigenvalue, canonical correlation, Wilks lambda and significance are 0.527, 0.588, 0.655 and 0.010, respectively. Percent of grouped cases correctly classified: 77.5%.

2. (a) 23 companies (b) 17 companies.

3. Figures in brackets indicate ranking according to competitive power.

A medium eigenvalue (0.527) and canonical correlation (0.588) indicate a moderate power of the function to discriminate. At 0.01 significance level, 31 (77.5%) of 40 observations are correctly classified.

In Table 11.6, in the case of West Germany only two variables significantly discriminate between the two industry groups. V278 is the most significant discriminated variable. As with Japan and the United States, both industry groups consider price and date of delivery to be the two most favourable competitive advantages, but Korean plant exporters have a far stronger advantage in meeting delivery date than have construction firms. Korean construction firms are more concerned

TABLE 11.6

INTERNATIONAL COMPETITIVE POWER OF KOREA RELATIVE TO <u>WEST GERMANY</u>

Variable Number	Factors	Weighted Mean Scores: Plant (a)	Weighted Mean Scores: Construction (b)	Weighted Mean Scores: Total
V275	Price	6.000(1)	6.000(1)	6.000(1)
V276	Technology	2.609(8)	2.375(8)	2.513(8)
V277	Payment condition	3.783(3)	3.875(3)	3.821(3)
* V278	Date of delivery	5.261(2)	4.313(2)	4.872(2)
* V279	After-sales service	3.478(4)	3.688(4)	3.564(4)
V280	Design ability	2.826(7)	2.438(7)	2.667(7)
V281	Information collection ability	3.174(5)	3.000(6)	3.103(6)
V282	Quality	3.174(5)	3.313(5)	3.231(5)
	Average	3.788	3.625	3.721

Source: The output of SPSS (Discriminant Analysis) for question No. 46. See Table 11.1.

Note: 1. * represents significantly discriminated variables. Eigenvalue, canonical correlation, Wilks lambda and significance are 0.402, 0.535, 0.714 and 0.002, respectively. Percent of grouped cases correctly classified: 72.5%.
2. (a) 23 companies (b) 16 companies.
3. Figures in brackets indicate ranking according to competitive power.

about technological factors (which are regarded as the two most unfavourable disadvantages by both industry groups) than are plant exporters. This pattern is the same as that of the United States.

The selected two discriminant variables have a moderate discriminant power and there is a significant difference in group centroids at 0.002 significance level. 29 (72.5%) of 39 firms were correctly classified, indicating this classification to be moderately effective (See Table 11.6).

In Table 11.7 four variables significantly discriminate between the two industry groups in the case of the U.K. The most significant dis-

TABLE 11.7

INTERNATIONAL COMPETITIVE POWER OF KOREA RELATIVE TO THE U.K.

Variable Number	Factors	Weighted Mean Scores: Plant (a)	Construction (b)	Total
V283	Price	6.227(1)	6.118(1)	6.179(1)
* V284	Technology	3.045(8)	3.471(6)	3.231(6)
V285	Payment condition	4.136(3)	4.118(4)	4.128(3)
* V286	Date of delivery	5.182(2)	4.706(2)	4.974(2)
V287	After-sales service	3.727(4)	4.412(3)	4.026(4)
* V288	Design ability	3.227(7)	2.765(8)	3.026(8)
V289	Information collection ability	3.364(6)	3.059(7)	3.231(6)
* V290	Quality	3.545(5)	3.765(5)	3.641(5)
	Average	4.057	4.052	4.055

Source: The output of SPSS (Discriminant Analysis) for question No. 47. See Table 11.1.

Note: 1. * represents significantly discriminated variables.
Eigenvalue, canonical correlation, Wilks lambda and significance are 0.744, 0.653, 0.573 and 0.0006, respectively.
Percent of grouped cases correctly classified: 84.6%.
2. (a) 22 companies (b) 17 companies.
3. Figures in brackets indicate ranking according to competitive power.

criminant variable is V286, followed by V288 and V284. The most favourable factors in both industry groups follow the previous patterns, namely price and date of delivery. In particular, plant exporters enjoy a competitive advantage in date of delivery more than construction firms. The most unfavourable factors for plant exporters are technology and design ability, and information collection ability and design ability for construction firms. However, Korean plant exporters are more concerned about technology (with a mean score of 3.045) and Korean construction firms about design ability (with a mean score of 2.765) when they compare their international competitive power with that of the U.K.

The selected discriminant variables have a strong discriminant power and validity because of a large value of eigenvalue (0.744) and canonical correlation (0.653) and there is a significant difference in group centroids at 0.0006 significance level. The classification function is highly effective since 33 (84.6%) of 39 observations were correctly classified.

As shown in Table 11.8, six variables significantly discriminate between the two industry groups in the case of Taiwan. The most significantly discriminated variable is V311 (after sales service), followed by V312 (design ability) and V308 (technology), and the least is V309 (payment condition), followed by V310 (date of delivery) and V313 (information collection ability). The most and least favourable factors in both industry groups are quite different from those of four developed countries discussed above. The two most favourable advantages compared with Taiwan are design ability and technology (with a mean score of 5.043 and 4.783, respectively) in plant exporters, and design ability and quality (with a mean score of 5.000, respectively) in construction firms. The two least favourable factors are price and after-sales service in plant exporters, and payment condition and price in construction firms.

TABLE 11.8

INTERNATIONAL COMPETITIVE POWER OF KOREA RELATIVE TO TAIWAN

Variable Number	Factors	Weighted Mean Scores: Plant (a)	Construction (b)	Total
V307	Price	4.261(7)	4.563(8)	4.385(7)
* V308	Technology	4.783(2)	4.750(4)	4.769(3)
* V309	Payment condition	4.304(6)	4.625(7)	4.436(6)
* V310	Date of delivery	4.522(4)	4.875(3)	4.667(4)
* V311	After-sales service	4.043(8)	4.688(5)	4.308(8)
* V312	Design ability	5.043(1)	5.000(1)	5.026(1)
* V313	Information collection ability	4.522(4)	4.688(5)	4.590(5)
V314	Quality	4.696(3)	5.000(1)	4.821(2)
	Average	4.522	4.774	4.625

Source: The output of SPSS (Discriminant Analysis) for question No. 50. See Table 11.1.

Note: 1. * represents significantly discriminated variables. Eigenvalue, canonical correlation, Wilks lambda and significance are 0.529, 0.588, 0.654 and 0.025, respectively. Percent of grouped cases correctly classified: 75.0%.
2. (a) 23 companies (b) 16 companies.
3. Figures in brackets indicate ranking according to competitive power.

The selected six discriminant variables have a moderate discriminant power and validity because of a medium value of eigenvalue (0.529) and canonical correlation (0.588) and there is a significant difference in group centroids at 0.025 significance level. 30 (75.0%) of 40 observations were correctly classified, indicating this classification is fairly effective.

Industry group results with regard to Korean international competitive power compared with that of France, Italy and Brazil are not discussed because selected discriminant variables in France and Italy have a weak discriminant power (canonical correlation $<$ 0.352) and significance level is over 0.09. In the case of Brazil, no variable qualified for analysis.

The overall pattern establishes Korea as a country with clearly defined competitive strengths and weaknesses relative to international competitors. From the evidence, Korean firms compete successfully against advanced industrial countries with respect to price and delivery but experience technological weaknesses. In contrast, price competitiveness is the greatest weakness and technological factors the great strengths in competition with Taiwan, the representative for NICs. It seems possible to argue that technology holds the key to continued growth of the Korean industries. Price advantages are likely to erode over time in favour of NICs and price differentials between Korea and advanced industrial countries will continue to shrink. An attention to technological development is essential to compete in the long run with both advanced countries and NICs.

11.2.2 ESTIMATION BY NON-KOREAN FIRMS

According to the output of SPSS Cross-analysis for question No. 40 of the questionnaire, 17 (89.5%) of the 19 non-Korean firms claimed that they had had occasion to compete with Korean plant and construction firms to win orders. Four of these firms replied that Korean firms had been strongly competitive; nine replied that they had been competitive;

two slightly competitive; and two firms regarded Korean firms as being uncompetitive. In general, therefore, from this evidence Korean firms are regarded as serious competitors in international markets.

Table 11.9 and Graph 11.4 show the factors (estimated by non-Korean firms) associated with the success or failure of Korean firms in plant and construction exports.

Non-Korean firms consider that the success of Korean firms has been highly influenced not by their technologies but by price and financial factors. In the case of the failure of Korean plant and construction exports, technological (i.e. low technology and inferior design ability) and financial factors (i.e. unsatisfactory payment conditions) have had an important effect. Payment conditions, it can be seen, have played an important role in both success and failure of Korean plant and construction exports with a mean score of 5.615 and 4.929, respectively.

The success of Korean firms has depended upon price and competent financial arrangements, and failure upon technology and inadequate finance. These views of non-Korean firms offer further evidence of the technological implications for Korean industry, but also highlight the role of finance in success and failure. Fortunately, payment conditions are capable of improvement because the Korean current account surplus is forecast to reach US$ 10 billion by the end of 1988 due to robust exports, soaring tourism revenues and increasing remittances by Koreans residing abroad (Korea Newsreview, April 9, 1988, pp. 12).

Table 11.10 and Graph 11.5 show Korean international competitive power (based on the sample of 13 non-Korean firms). As shown in the table and graph, the Korean competitive power is portrayed by two country groups, namely, 8 developed countries and one NIC (Taiwan).

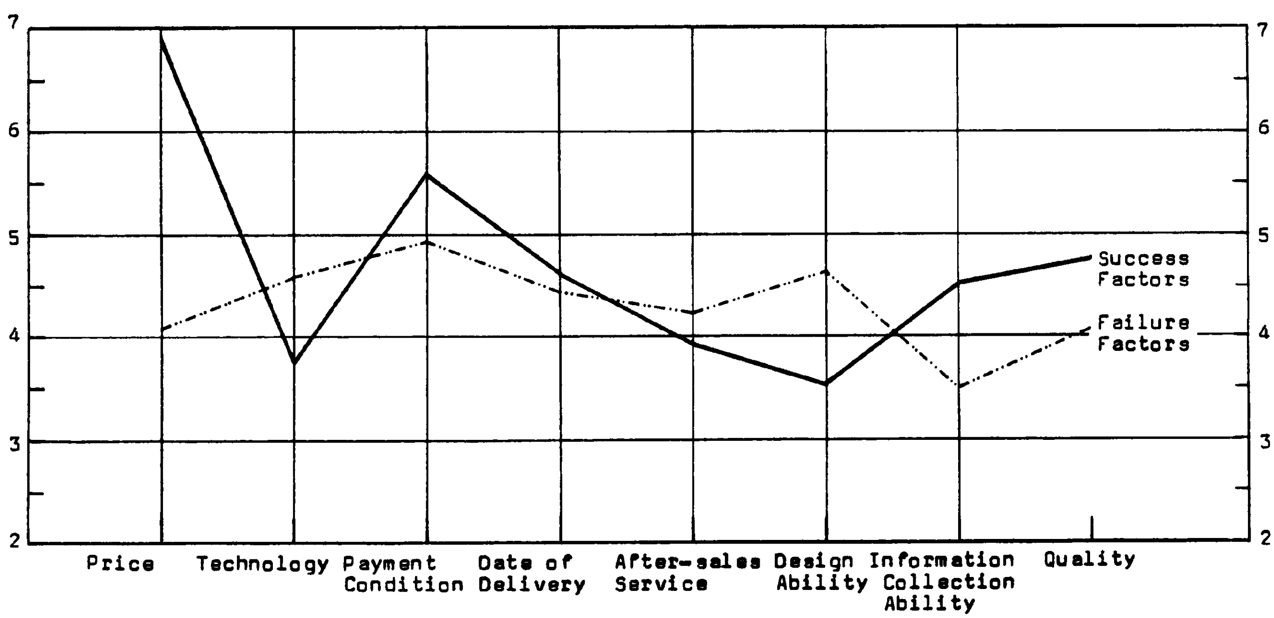
TABLE 11.9

FACTORS ESTIMATED BY NON-KOREAN FIRMS WHICH HAVE INFLUENCED THE SUCCESS AND FAILURE OF KOREAN FIRMS FOR OVERSEAS PLANT AND CONSTRUCTION EXPORTS

Success Factors	Mean Scores(a)	Failure Factors	Mean Scores(b)
Price competitive	6.923(1)	Price disadvantage	4.071(6)
High technology attitudes	3.769(7)	Low technology attitudes	4.571(3)
Competitive payment conditions	5.615(2)	Unsatifactory payment conditions	4.929(1)
Quick delivery	4.615(4)	Delayed delivery	4.429(4)
Better after-sales service	3.923(6)	Poor after-sales service	4.214(5)
Superior design ability	3.538(8)	Inferior design ability	4.643(2)
Competent knowledge of plant and construction markets	4.538(5)	Inadequate knowledge of the plant & construction markets	3.500(8)
Good quality	4.769(3)	Poor quality	4.071(6)

GRAPH 11.4

FACTORS ESTIMATED BY NON-KOREAN FIRMS WHICH HAVE INFLUENCED THE SUCCESS AND FAILURE OF KOREAN FIRMS FOR OVERSEAS PLANT AND CONSTRUCTION EXPORTS



Source: The output of SPSS (Discriminant Analysis) for question No. 41 and 42. See Table 11.1.
The values are from 7 (highly influential) to 1 (highly uninfluential).
Note: 1. (a) 13 companies, 9 countries (b) 14 companies, 9 countries.
2. Figures in brackets indicate ranking according to degree of influence.

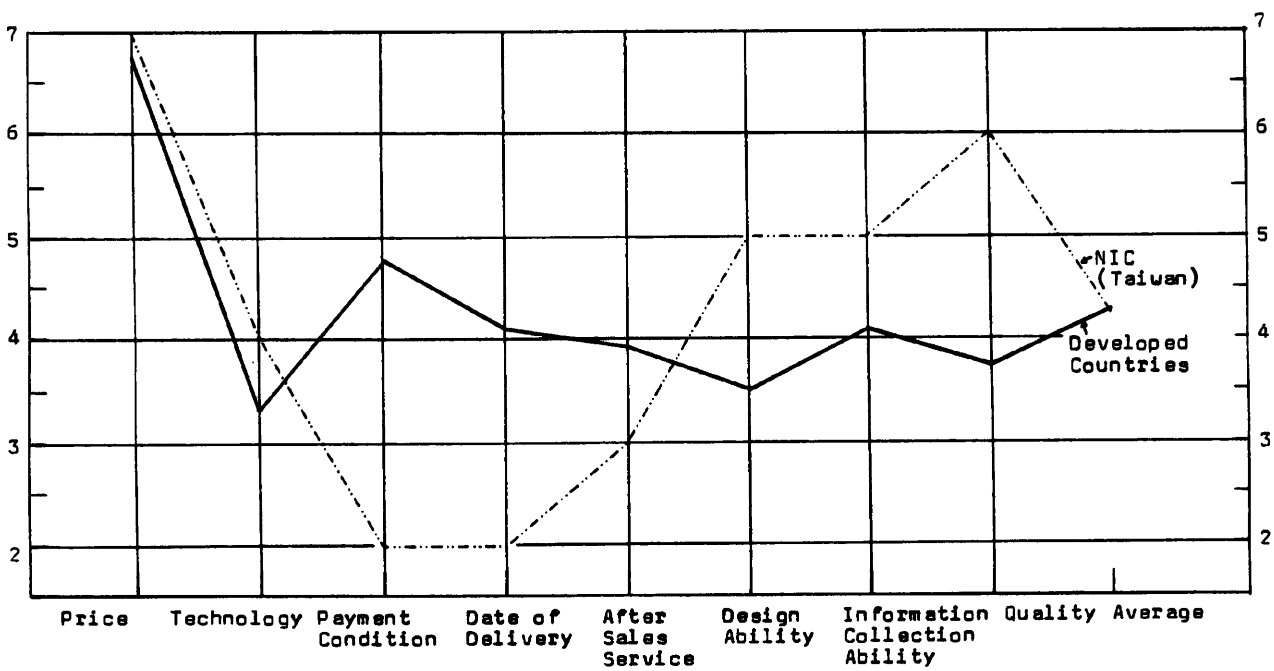
TABLE 11.10

COMPARISONS OF KOREAN INTERNATIONAL COMPETITIVE POWER
ESTIMATED BY NON-KOREAN FIRMS

Variable Number	Factors	Weighted Developed Countries(a)	Mean NIC (b)	Scores Total
V251	Price	6.750(1)	7.000(1)	6.769(1)
V252	Technology	3.333(8)	4.000(5)	3.385(8)
V253	Payment condition	4.750(2)	2.000(7)	4.538(2)
V254	Date of delivery	4.083(3)	2.000(7)	3.923(4)
V255	After-sales service	3.917(5)	3.000(6)	3.846(6)
V256	Design ability	3.500(7)	5.000(3)	3.615(7)
V257	Information collection ability	4.083(3)	5.000(3)	4.154(3)
V258	Quality	3.750(6)	6.000(2)	3.923(4)
	Average	4.271	4.250	4.269

GRAPH 11.5

COMPARISONS OF KOREAN INTERNATIONAL COMPETITIVE POWER ESTIMATED BY NON-KOREAN FIRMS.



Source: The output of SPSS (Discriminant Analysis) for question No. 43. See Table 11.1.
Note: 1. (a) 12 companies, 8 countries (b) only one company from Taiwan, which is a Newly Industrialised Country (NIC).
2. Figures in brackets indicate ranking according to competitive power strength.

Non-Korean firms of developed countries consider that Korea has a considerable comparative advantage in price, some advantage in payment conditions and a slight advantages in date of delivery and information collection ability. Technological factors including design ability are regarded as the two most unfavourable factors. In contrast, a firm from Taiwan considers that Korea has a fairly competitive advantage in technological factors (i.e. design ability and quality with a mean score of 5.00 and 6.00, respectively), but price ranks as the most favourable advantage. The same firm regards payment conditions and date of delivery as the greatest disadvantages, with a mean score of only 2.00, which is significantly different from that of developed countries. Such a significant difference may be attributed to a subjective judgement resulting from only one sample firm.

In comparison with Korean international competitive power estimated by Korean firms, which is portrayed in Table 11.1 and Graph 11.1, non-Korean firms from developed countries emphasise payment conditions and de-emphasise date of delivery. The firm from Taiwan greatly under-plays these two factors compared with the 39 Korean firms which consider them to be somewhat competitive. In contrast, one firm from NIC (Taiwan) overestimates Korean competitive power in terms of price and quality compared with that estimated by Korean firms, suggesting the need for further research. With the exception of these variables, the perception of Korean and non-Korean firms are generally similar.

According to a recent survey[2] executed by the Korea Foreign Trade Association (KFTA)[3], the locomotive of the Korean economy - exports - is losing competitive power as foreign buyers turn to China and Taiwan for cheaper goods. KFTA found 57.2% of foreign buyers are seriously considering shifting import sources from Korea where the recent appreciation of the won (Korean currency) has made Korean-made items growingly expensive.

Table 11.11 shows the competitive power of Korean commodities compared with that of Taiwan and Hong-Kong, Korea's major trading rivals.

TABLE 11.11

COMPETITIVE POWER OF KOREAN COMMODITIES COMPARED WITH THAT OF TAIWAN AND HONG-KONG, KOREA'S MAJOR TRADING RIVALS

Unit: %

Factors	1986			1987		
	about the same	somewhat		about the same	somewhat	
		low inferior bad weaker	higher superior better stronger		low inferior bad weaker	higher superior better stronger
Price(1)	63.2	20.2	16.6	65.7	13.3	21.0
Quality(2)	77.7	5.6	16.7	74.7	9.3	15.9
After-sales service(3)	--	--	6.7	65.7	31.3	3.0
Design and packaging(2)	70.8	17.9	11.3	74.7	12.1	13.2
Overall competitive power(4)	--	--	23.3	71.7	13.9	14.4

Source: Korea Newsreview, January 16, 1988, pp. 19.
Note: (1) low, higher (2) inferior, superior (3) bad, better (4) weaker, stronger.

As shown in the table, Korean exports are losing competitive power with regard to all competitive factors except design and packaging compared with rival countries between 1986 and 1987. In particular, Korean firms are considerably losing competitive power in terms of price, largely attributable to the recent steep appreciation of the won. For this reason, the overall competitive power of Korean goods has markedly dropped from 23.3% (somewhat stronger) to 14.4% between 1986 and 1987.

Table 11.12 shows the major reasons for switching the import sources from Korea to other countries. The higher cost of Korean goods is regarded as the most important reason, followed by delayed shipments, both factors being affected by labour disputes (which result in pay hikes and delayed shipments) and the appreciation of the Korean currency. According to Korean Labour Ministry statistics, 284 cases of labour strike have been reported as of April 9, 1988, up 226 over 58 labour disputes during the same period in 1987. The primary cause of labour conflicts has been due to breakdowns in labour management negotiations over pay claims and other demands (Korea Newsreview, April 16, 1988).

TABLE 11.12

ALTERNATIVE IMPORT SOURCES TO KOREA

Unit: %

Other Countries From Korea		Major Reasons For Switching	
China	42.1	High costs of Korean goods	70.7
Taiwan	27.6	Delayed shipments	10.1
Hong-Kong	14.5	Low quality	9.1
South-East Asian Nations	10.5	Substandard design and packaging	2.0
Japan	2.6	Other reasons	10.0

Source: Korea Newsreview, January 16, 1988, pp. 19.

In Table 11.12, China is shown to be the most favourable country as an alternative import source by foreign buyers (accounting for 42.1%), followed by Taiwan. This may be attributable to their cheap labour costs. Most foreign buyers regard Korea's fastidious customs clearance procedure and fluctuations in exchange rate as major constraints to business in Korea. The Korean currency (won) will continue to appreciate to a degree that, in conjunction with other policy instruments, ensures containment of the current-account surplus at an optimal level.

It is clearly in the interests of Korea to coordinate exchange rates with developed countries, but the Korean government should also take other export-stimulating measures to avoid eroding the international competitive power of Korean export items. Among other things, bank interest rates should be brought into line with those of its trading rivals. In fact, the bank lending rate in Korea is almost double that in Taiwan.

11.3 A COMPARISON OF THE INTERNATIONAL COMPETITIVE POWER OF PLANT EXPORTS BY "REVEALED" COMPARATIVE ADVANTAGE

This section presents a comparison of the international competitive power of plant exports according to the concept of "revealed" comparative advantage, which may be indicated by the trade performance of individual countries.

11.3.1 THE THEORETICAL BACKGROUND AND THE CONCEPT OF "REVEALED" COMPARATIVE ADVANTAGE

Since there is a lack of appropriate data on production costs in the manufacturing industries of individual countries, it is proposed to draw upon prevailing theories of international specialisation for determining the pattern of comparative advantage. Among these approaches, the Heckscher-Ohlin theory and the classical theory of comparative advantage can be considered. While the hypothesis advanced by classical economists presupposes the existence of inter-country differences in production functions, the Heckscher-Ohlin theory assumes identical production functions and qualitatively identical factors of production in the trading countries and attributes international specialisation to differences in factor endowments (Balassa, 1963). Therefore, if allowance is made for differences in tastes, relative factor endowments can be expressed in terms of relative factor prices. That is to say, in the familiar two-country two-factor model the country with the lower relative price of labour will be considered to be labour-abundant, and the trade-partner to be capital-abundant.

However, difficulties arise in attempting to apply the Heckscher-Ohlin theory to the three-factor case and to more than two countries. The introduction of more countries and more factors further complicates the problem. And non-price factors are not considered in their theory. As a result, the Heckscher-Ohlin theory is not suitable as a guide in evaluating comparative advantage.

When data on labour productivity have been used as a proxy for efficiency, considering inter-country differences in the efficiency of individual industries forms the basis of the explanation given by the classical theory of comparative advantage. In the United States - United Kingdom comparisons (MacDougall, 1951 and Balassa, 1963) the explanatory value of this hypothesis has been indicated.

Since neither the Heckscher-Ohlin theory nor the classical theory of comparative advantage furnish sufficient data for determining the structure of exports in particular industries, Balassa (1967) utilised information on "revealed" comparative advantage as an alternative solution. It is suggested by him that "revealed" comparative advantage can be indicated by the trade performance of individual countries with regard to manufacturing products, in the sense that the commodity pattern of trade reflects relative costs as well as the influence of non-price factors, such as goodwill, quality, and the availability of servicing and repair facilities. Liesner (1958) used relative export performance as an indicator of comparative advantage in examining the possible effect of entry into the Common Market on British Industry.

Accordingly, the "revealed" comparative advantage in a particular country will tend to determine the structure of exports and can be indicated by her trade performance with respect to individual industries.

That is to say, export performance can be evaluated by comparing the relative shares of a country in the world exports of individual commodities. The data have to be made comparable through appropriate "normalisation", which can be accomplished by dividing a country's share by the total combined exports of manufactured goods in the world, and expressing the result in index number form. The expression "relative share" refers to the ratio of the share of country *i* in the exports of commodity *j* to the share of country *i* in the exports of all manufactured goods (Balassa, 1965).

General plant goods have already been defined in chapter four according to the Standard International Trade Classification (S.I.T.C., see Table 4.1). The "revealed" comparative advantage of country *i* in the exports of commodity *j* (I_{ij}) can be represented as follows:

$$I_{ij} = \frac{X_{ij}}{X_{nj}} \Big/ \frac{X_{it}}{X_{nt}} = \frac{X_{ij}}{X_{it}} \Big/ \frac{X_{nj}}{X_{nt}}$$

where X_{ij} = the export volume of commodity *j* in country *i*

X_{nj} = the world export total[4] of commodity *j*

X_{it} = the export volume of manufactured goods[5] in country *i*

X_{nt} = the world export total of manufactured goods.

Thus, for a given export commodity of a particular country, an index number 120 will mean that the country has a comparative advantage in the international market by 20.0 % higher than the world average level.

Indices of "revealed" comparative advantage indicate relative advantages (and disadvantages) for individual countries, but the dispersion of these indices is likely to differ from country to country.

11.3.2 AN INTERNATIONAL COMPARISON OF COMPETITIVE POWER IN PLANT EXPORTS

Tables 11.13 and 11.14 show the indices of "revealed" comparative advantage by plant exports items of major countries, respectively, in 1985 and 1981.

In Table 11.13, the United States appears to have relative advantages with respect to overall general plant (154.7), followed by the U.K. (124.6) and Italy (120.0). In particular, the US has relative advantages with regard to railway vehicles, aircraft, non-electrical power and agricultural machinery, and machines for special industries (i.e. civil engineering equipment). On the other hand, the US is at a disadvantage in the production of textile and leather, metalworking machinery and structures and parts of iron and steel.

Aircraft, non-electrical power machinery except steam engines and turbines, telecommunication equipment and structures and parts of iron and steel also appear on the list of products in which West Germany has a comparative disadvantage. At the same time, West Germans possess relative advantages in manufacturing railway vehicles, agricultural, textile and leather machinery; further commodities on this list are metalworking machinery, machines for special industries except civil engineering equipment, non-electrical machines n.e.s., and electrical power machinery and switchgear.

Japan is shown to have relative advantages in manufacturing steam boilers, textile and leather, metalworking, electrical power machinery and switchgear and telecommunication equipment, and disadvantages in producing aircraft, engines and motors n.e.s. (not elsewhere specified), agricultural machinery except tractors, machines for special industries except civil engineering equipment, pumps for liquids etc and non-electrical machinery and tools n.e.s., and structures and parts of iron and steel.

By and large, Britain possesses relative advantages in regard to aircraft, non-electrical power machinery, non-road tractors, machines for special industries, non-electrical machines n.e.s. except heating and cooling equipments, rotating electric plant and electricity distributing machinery, and structurs and parts of iron and steel. Britain appears to be at a comparative disadvantage in the manufacture of agricultural machinery except non-road tractors, textile and leather, metalworking machinery, heating and cooling equipments, electrical power machinery n.e.s., and telecommunication equipments.

Railway vehicles, structures and parts of iron and steel, aircraft, and electrical power machinery and switchgear are on the top of France's list, followed by non-electrical machines n.e.s. except tools. Relative disadvantages arise in manufacturing steam engines and turbines, textile and leather machinery, metalworking machines and tools, machines for special industries, non-electrical tools, and telecommunication equipments n.e.s..

Aircraft, non-electrical power machinery and civil engineering equipment also appear on the list of products in which Italy has a comparative disadvantages; further commodities on this list are electrical power machinery and switchgear and telecommunication equipments n.e.s.. Italy is at a relative advantage in the production of agricultural, textile and leather, metalworking machinery, machines for special industries except civil engineering equipments, non-electrical machines n.e.s. except mechanical handling equipments, and structures and parts of iron and steel.

Korea and Hong Kong (NICs), possess few relative advantages. Korea appears to be at a comparative advantage in the manufacture of steam boilers and auxiliary plant, other power generating machinery, electrical power machinery n.e.s., and structures and parts of iron and steel which feature among nine industrialised countries (569.9%). This can be largely accounted for by the volume of construction exports in the Middle-East and high export growth of pylons (which are installations for transmitting power) and marine structures. Hong Kong possesses relative advantages in the production of textile and leather, electrical power machinery n.e.s., and telecommunication equipments n.e.s.. Otherwise, both countries have comparative disadvantages in manufacturing plant products compared with the six developed countries which have already been discussed and the one NIC (Singapore).

Finally, Singapore appears to have relative advantages with regard to aircraft, pumps n.e.s., centrifuges, non-electrical machines parts, electrical power machinery and switchgear except electricity distributing machinery, and telecommunication equipment n.e.s., while she appears to be at a disadvantage in the production of railway vehicles, non-electrical power, agricultural, textile and leather machinery and structures and parts of iron and steel.

In comparison with other NICs, such as Hong Kong and Singapore, Korea appears to fall behind in most plant export items. For example, Korea lags considerably behind Singapore in the production of aircrafts and non-electrical machines n.e.s. and behind Hong Kong and Singapore in the manufacture of textile and leather machinery, metalworking machi-

TABLE 11.13

Indices of "Revealed" Comparative Advantage by Plant Export Items of Major Countries, 1985

Unit: %

SITC	Product Items	U.S.A.	West Germany	Japan	U.K.	France	Italy	Korea	Hong Kong	Singa-pore
	Total General Plant	154.7	114.8	94.0	124.6	102.0	120.0	39.1	46.3	117.5
791	Railway Vehicles	157.9	129.6	79.9	93.4	270.0	103.9	42.5	1.2	0.9
792	Aircraft ETC	370.7	79.7	2.7	176.9	127.0	70.7	34.6	4.8	138.5
	Power Machinery Non-Elec	197.3	86.6	75.4	174.4	101.0	56.2	22.9	9.6	41.7
711	Steam Boilers and Aux Plant	108.7	65.2	231.6	150.6	96.3	45.6	139.8	14.2	15.0
712	Steam Engines, Turbines	156.1	157.2	129.2	140.3	77.9	76.0	4.6	0.6	29.9
713	Intrnl Combus PSTN Engine	175.7	94.0	103.3	95.6	89.7	55.6	3.8	13.4	60.6
714	Engines and Motors NES	271.1	47.6	8.7	346.4	122.4	60.5	24.8	5.1	15.0
718	Other Power Generating Machinery	106.7	181.3	23.3	60.0	109.1	34.1	119.7	1.8	31.4
	Agricultural Machinery	140.9	130.0	77.4	151.3	100.1	200.3	1.2	1.3	5.0
721	Agricultural Machinery EXC Tractors	146.2	128.1	41.5	83.3	111.1	163.0	2.2	2.4	5.9
722	Tractors Non-Road	135.4	132.1	115.3	222.9	88.4	239.5	0.3	0.1	4.2
724	Textile and Leather Machinery	45.2	189.0	116.0	67.0	55.6	225.1	15.5	108.1	36.1
	Metalworking Machinery	76.9	150.1	152.0	86.3	58.0	163.1	9.0	35.5	59.0
736	Metalworking Machine-Tools	69.9	158.4	155.0	83.4	47.8	161.9	10.5	28.1	65.3
737	Metalworking Machinery NES	101.4	121.0	141.3	96.3	93.4	167.5	3.5	61.6	37.0
	Machines for Special Industries	156.5	135.2	84.5	123.1	75.1	146.1	7.2	36.7	101.0
723	Civil Eng Equipment ETC	233.3	74.9	100.9	125.7	92.4	56.7	4.8	26.5	15.8

TABLE 11.13 - Continued

SITC	Product Items	U.S.A.	West Germany	Japan	U.K.	France	Italy	Korea	Hong Kong	Singa-pore
725	Paper Mill Machinery	72.1	175.5	48.5	98.1	71.1	152.7	8.9	26.5	15.8
726	Printing, BKbings Machinery,PTS	90.9	249.4	73.6	181.8	63.0	97.7	2.3	39.5	23.1
727	Food Machinery Non-domestic	91.7	111.9	29.7	110.4	70.5	247.0	1.1	45.3	30.7
728	Other Machry for Special Industries	132.8	152.7	87.3	112.3	65.4	215.5	11.0	50.4	76.3
	Machines NES Non-Elec	107.1	143.0	95.0	114.8	112.4	173.8	16.7	28.4	101.7
741	Heating, Cooling Equipments	130.6	105.8	117.2	79.1	119.4	208.1	13.6	53.3	44.2
742	Pumps for Liquids ETC	141.9	162.7	66.0	126.4	115.6	162.0	7.4	10.1	66.9
743	Pumps NES, Centrfuges	119.2	133.0	95.3	154.6	123.9	157.9	4.0	25.5	161.6
744	Mechanical Handling Equipments	98.1	120.5	114.7	121.6	114.2	96.1	42.6	23.3	70.4
745	Non Elec Machinery, Tools NES	107.8	191.4	61.8	93.8	58.5	226.2	5.0	26.8	28.9
749	Non Elec Machines PTS, ACC...	78.1	158.7	92.5	119.3	124.1	185.9	18.3	22.8	173.1
	Elec Power Machinery Switchgear	105.2	125.9	114.3	100.7	125.0	76.9	42.8	92.0	334.0
716	Rotating Electric Plant	108.9	106.2	128.6	129.8	124.6	96.4	34.3	87.1	151.5
771	Electric Power Machinery, NES	60.6	105.4	138.9	68.8	83.3	54.1	140.5	246.4	207.1
772	Switchgear ETC, Parts NES	115.7	139.8	132.5	97.0	136.4	74.9	19.8	52.3	445.2
773	Electr Distributing Machinery	117.8	83.3	97.0	112.2	119.0	83.2	62.6	35.1	50.8
764	Telecommunication Equipment NES	114.3	54.2	190.4	81.4	84.4	64.0	84.7	162.3	171.2
6911	Structures, Parts Iron Steel	32.1	78.1	63.9	126.9	139.1	159.6	569.9	15.2	60.8

Source:OECD Foreign Trade Series C, 1985
UN; Yearbook of International Trade Statistics, 1985.

TABLE 11.14

Indices of "Revealed" Comparative Advantage by Plant Export Items of Major Countries, 1981

Unit: %

SITC	Product Items	U.S.A.	West Germany	Japan	U.K.	France	Italy	Korea	Hong Kong	Singa-pore
	Total General Plant	161.5	110.7	87.7	134.9	97.1	102.0	29.8	20.6	95.1
791	Railway Vehicles	121.0	104.8	52.3	178.9	254.9	56.2	69.6	0.6	2.0
792	Aircraft	351.8	81.3	3.0	144.1	97.8	61.8	29.2	2.9	60.0
	Power Machinery Non-Elec	191.0	84.2	76.8	235.1	92.4	66.9	15.0	8.5	63.5
711	Steam Boilers and Aux Plant	211.4	84.6	130.9	108.6	75.5	87.5	5.2	3.7	7.8
712	Steam Engines, Turbines	137.7	113.8	129.6	139.9	176.7	97.5	0.4	0.3	15.2
713	Intrnl Combus PSTN Engine	179.1	106.5	103.7	166.0	97.7	65.6	6.5	12.4	89.0
714	Engines and Motors NES	239.0	30.6	11.3	434.2	53.5	62.1	36.6	5.4	42.8
718	Other Power Generating Machinery	46.9	131.6	50.2	68.0	195.2	50.9	6.2	0.3	39.9
	Agricultural Machinery	199.1	94.6	63.7	148.1	66.6	132.9	1.1	1.0	5.5
721	Agricultural Machinery EXC Tractors	181.4	108.2	22.7	78.3	91.9	99.4	2.2	1.4	6.8
722	Tractors Non-Road	213.2	83.7	96.5	203.9	46.3	159.8	0.2	0.7	4.4
	Metalworking Machinery	102.5	163.7	111.2	107.5	68.2	138.0	15.7	12.2	43.9
736	Metalworking Machine-Tools	95.6	177.0	113.9	98.1	61.9	132.9	17.5	9.6	49.0
737	Metalworking Machinery NES	126.4	117.8	101.9	140.1	90.3	155.8	9.6	21.1	26.3
724	Textile and Leather Machinery	55.5	172.9	112.9	95.3	59.8	160.8	24.0	78.9	37.4
	Machines for Special Industries	187.1	121.9	60.0	129.8	89.0	107.2	6.4	12.6	112.5
723	Civil Eng Equipments ETC	278.0	66.0	69.9	127.9	93.4	38.8	3.5	4.1	206.0

TABLE 11.14 - Continued

SITC	Product Items	U.S.A.	West Germany	Japan	U.K.	France	Italy	Korea	Hong Kong	Singa-pore
725	Paper Mill Machinery	93.5	164.3	41.5	110.6	90.9	90.1	4.8	20.8	7.5
726	Printing, BKbings Machinery, PTS	148.7	232.6	44.7	159.4	57.0	82.2	3.3	14.0	31.3
727	Food Machinery Non-domestic	119.5	119.1	22.4	137.9	99.8	168.8	0.7	15.4	42.6
728	Other Machry for Special Industries	114.7	154.6	60.7	127.0	89.6	187.7	11.8	20.6	49.6
	Machines NES Non-Elec	124.3	128.3	103.3	117.6	103.7	129.7	13.5	12.9	96.7
741	Heating, Cooling Equipments	144.5	85.8	158.3	73.8	96.2	155.9	28.7	13.9	58.0
742	Pumps for Liquids ETC	139.6	141.9	80.6	152.0	105.0	108.0	6.6	4.7	73.8
743	Pumps NES, Centrfuges...	152.4	113.6	90.4	139.0	105.9	126.6	3.5	11.0	153.0
744	Mechanical Handling Equipments	120.3	116.6	105.3	118.0	115.5	86.9	14.1	9.2	64.3
745	Non Elec Machinery, Tools NES	136.5	173.8	49.5	101.2	55.4	149.5	5.6	14.6	27.7
749	Non Elec Machinery PTS, ACC...	85.6	151.3	99.5	132.9	120.7	140.3	13.3	17.8	154.1
	Elec Power Machinery Switchgear	106.4	119.8	115.5	116.7	127.0	71.7	35.9	44.4	186.5
716	Rotating Electric Plant	130.2	99.9	121.9	166.0	124.4	74.9	25.0	23.0	135.2
771	Electric Power Machinery, NES	64.2	114.9	142.9	72.1	108.4	54.4	110.4	111.8	139.2
772	Switchgear ETC, Parts NES	104.7	132.4	136.1	101.4	133.7	74.7	21.4	37.8	228.6
773	Electr Distributing Machinery	81.2	90.5	139.6	111.4	104.3	114.6	95.8	25.3	56.8
764	Telecommunication Equipment NES	105.8	69.6	174.8	103.7	69.6	45.7	76.4	72.5	184.6
691	Structures, Parts Iron, Steel	71.0	71.6	64.2	97.6	164.0	204.9	212.9	7.8	82.5

Source: OECD Foreign Trade Series C, 1981
UN: Yearbook of International Trade Statistics, 1984.

nery, machines for special industries, and even electrical power machinery and switchgear and telecommunication equipments (which are major Korean exports). However, Korea enjoys a considerable comparative advantage in structures and parts of iron and steel compared with the above two NICs. These findings indicate that the export performances of Hong Kong and Singapore have a stronger industrial base on which to build their plant exports than has Korea, and it may be difficult for Korea to speed up plant exports in the long term.

In comparison with developed countries, the three NICs (Korea, Hong Kong and Singapore) possess relative advantages in the production of electrical power machinery n.e.s. and telecommunication equipment which is homogeneous and labour-intensive. As a result, national product differentiation plays a relatively small role and trade patterns are determined largely by inter-country differences in relative costs. In particular, low labour costs in the three NICs have contributed to their comparative advantages in the above product groups. On the other hand, non-electrical power and metalworking machinery, as well as machines for special industries and most non-electrical machines n.e.s. (which are technological intensive products) are characterised by specialisation within commodity categories, and most developed countries appear to be at a relative advantage in the manufacture of these commodity categories.

To examine the relative position of the countries with regard to the various groups of products an indication of the pattern of comparative advantages by the commodity group can be provided.

In transport equipment, we find the United States in the lead in the case of aircrafts, but behind France in railway vehicles.

In the non-electrical power machinery group, the US leads in steam engines and turbines (with similar level to West Germany) and internal combustion piston engines, and Italy is at the bottom of the list among the six developed countries. At the same time, the United Kingdom and Japan have relative advantages in the manufacture of engines and motors n.e.s. and steam boilers, respectively. In turn, West Germany is in a leading position with regard to steam engines, turbines and other power generating machinery.

As to agricultural machinery, Italy possesses relative advantages in manufacturing agricultural machinery, including non-road tractors, and in the production of textile and leather machinery.

By and large, the US, the UK and France are at a disadvantage in metalworking machinery. Within this industry group, Italy leads but with a similar level to Japan and West Germany.

Turning to machines for special industries, we find the US to possess relative advantages in producing civil engineering equipments, but cedes first place to West Germany in the case of paper mill, printing and book binding machinery, and to Italy in non-domestic food machinery and other machinery for special industries.

Among non-electrical machines n.e.s., Italy leads generally in most items in this group, but lies behind West Germany in the case of pumps for liquids etc, Singapore in pumps n.e.s. and centrifuges, and the UK in mechanical handling equipments. On the whole, Italy and West Germany are at an advantage in the non-electrical machine group.

In the case of electrical power machinery and switchgear products, Itay is at a disadvantage in most of this group. Singapore leads in rotating electrical plant and switchgear products and shares first place with Hong Kong in electrical power machinery n.e.s. and with France in electricity distributing machine. However, Japan is generally at an advantage in most of this group. Finally, Korea leads in the exportation of structures and parts of iron and steel, with the US and Hong Kong at the bottom of the list.

With regard to changes in the indices of "revealed" comparative advantage between 1981 and 1985 (which are portrayed in Tables 11.14 and 11.13, respectively), the developed countries, except Italy, show generally only slight changes in RCA by plant product items, indicating a mature phase of plant exports. In contrast, Italy and NICs show a relatively rising trend. In particular, increases in RCA in Hong Kong and Singapore significantly exceed improvements in Korea.

We have set out to examine the "revealed" comparative advantage of major industrial countries including NICs in general plant goods by utilising available information on their trade performance. It appears that specialisation within commodity categories is observable in regard to precision machinery in the developed countries and light electrical and telecommunication equipments in the NICs, indicating that differences in the level of technology are often considerably important, and labour costs greatly affect the determination of comparative advantage in the case of light electrical and telecommunication equipments. It also appears that the traditional gains derived from substituting cheaper imports for more expensive domestic merchandise are relevant in regard to simple and labour-intensive manufactures such as textile and leather machinery, electrical power machinery n.e.s. and structures and parts of iron and steel.

Finally, it would appear desirable to examine the stability of the "revealed" comparative advantage indices, the effects of changes in relative prices on these indices, and the relationship between the level of technological development and comparative advantage in plant exports.

11.4 ATTITUDES OF PLANT EXPORTERS AND CONSTRUCTION FIRMS TOWARDS THE EDUCATION SYSTEM

This section presents and analyses the findings of our survey on the attitudes of the responding executives of Korean and non-Korean firms towards the education system in terms of the capability of the general and technical education system to provide an adequate labour force for the plant and construction industry. In addition, the results of a country comparison relative to the relevance of the general education system and the standard of recently appointed technicians are also presented. Our main concern here is to throw light on how the education system is seen by those executives as a competent source of manpower.

11.4.1 GENERAL EDUCATION SYSTEM

The Capability of the General Educational System and its Relevance to Plant Exporters and Construction Firms

As shown in Table 11.15, non-Korean firms appear to have been supplied more adequately with qualified manpower by their education system than have Korean firms (with a mean score of 3.737).

This may be regarded as a contributory factor in Korea to the technological weakness of Korean firms in technological factors such as design ability and quality.

The variable has a fairly strong discriminant power and there is a significant difference in the respective country group centroids at 0.0000 significance level, with 53 (86.9%) of 61 observations being correctly classified.

TABLE 11.15

A COUNTRY COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES REGARDING THE CAPABILITY OF GENERAL EDUCATIONAL SYSTEM TO PROVIDE ADEQUATE MANPOWER

Variable Number	Factor	Weighted Mean Score	
		Korea (a)	11 Other Countries(b)
* V345	The capability of the general education system to provide adequately qualified manpower	2.857	3.737

Source: The output of SPSS (Discriminant Analysis) for question No. 56. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: 4 (very capable); 3 (fairly capable); 2 (fairly incapable); and 1 (very incapable).

Note: 1. * represents significantly discriminated variable.
Eigenvalue, canonical correlation, Wilks lambda and significance are 0.683, 0.637, 0.594 and 0.0000, respectively.
Percent of grouped cases correctly classified: 86.9%.
2. (a) 42 companies (b) 19 companies, 11 countries.

<u>Perceived Reasons for the Ineffectiveness of the Korean Education System</u>

This part discusses the factors which explain the attitudes of Korean plant exporters and construction firms concerning the incapability of the Korean educational system to provide adequate manpower.

The following reasons were given and ranked according to their relative importance by Korean firms when asked to explain the incapacity of the Korean education system to provide adequate manpower. Table 11.16 presents their responses.

TABLE 11.16

REASONS FOR THE INEFFECTIVENESS OF THE KOREAN EDUCATION SYSTEM

Variable Number	Reasons	Weighted Mean Score
V346	The system is highly academically oriented	5.385(3)
V347	Neglect of technical and vocational training	5.038(6)
V348	Concentration on quantity rather than quality	4.885(7)
V349	Absence of clear long-run educational planning	6.000(1)
V350	Lack of connection between educational policies and employment policies	5.077(4)
V351	Lack of modern techniques and facilities	5.500(2)
V352	Alienation from society's real problems	5.077(4)

Source: The output of SPSS (Discriminant Analysis) for question No. 57. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: from 7 (extremely important) to 1 (extremely unimportant).

Note: 1. The sample of Korean firms consists of 18 plant exporters and 8 construction firms.

2. Figures in brackets indicate ranking according to relative importance.

In Table 11.16, the absence of clear long-run educational and employment policies is ranked as the first reason for the inability of the education system to provide qualified labour. This may be attributable to the following factors: 1) The unplanned expansion of secondary and higher education; 2) A free, mass education system which neglects specialist training and education; and 3) An admissions policy which allows the bulk of primary education students to proceed to higher education. These factors reflect the political and social pressures imposed on the educational planners since the early 1960s.

The rigidity associated with these pressures has made it difficult for educational planners to formulate a clear educational strategy. In addition, the absence of such a strategy has not helped the educational planners to respond to national, regional and international developments, including economic and technological considerations and the emigration of Korean labour to foreign countries.

Suggestions of Korean Plant Exporters and Construction Firms to Improve the General Education System in Korea

In the light of the previous question (No.57), a related question was put to the Korean plant exporters and construction firms. They were asked for suitable measures which would improve the Korean educational system in the light of the constraints preventing the provision to industry of qualified labour. Table 11.17 shows the measures suggested by them.

According to Table 11.17, the two most important measures that should be taken to improve the educational system and increase its capability to supply adequate manpower are connected with technical education, namely the provision of schools with modern techniques and facilities placing special emphasis on technical education.

TABLE 11.17

MEASURES SUGGESTED BY KOREAN FIRMS TO IMPROVE THE EDUCATION SYSTEM

Variable Number	Measures	Weighted Mean Score
V353	Providing schools with modern techniques and facilities	5.789(1)
V354	Paying considerable attention to technical education	5.500(2)
V355	Making use of the experience of developed countries	5.237(3)
V356	Linking education plans with labour market requirements	4.474(4)
V357	Encouraging students to enter technical institutes	4.263(5)
V358	Introducing new courses dealing with society's problems	4.237(6)

Source: The output of SPSS (Discriminant Analysis) for question No. 58. See Table 11.16.

Note: 1. The sample of Korean firms consists of 21 plant exporters and 17 construction firms.

2. Figures in brackets indicate ranking according to relative importance.

11.4.2 THE TECHNICAL EDUCATION SYSTEM IN KOREA

How Korean Firms Perceive the Technical Education System

When Korean firms were asked more specific questions about the extent to which the Korean system of technical education satisfies the needs of the plant and construction industry for an adequate technical labour force, the following responses, as shown in Table 11.18, were obtained. One third of Korean respondents believe that the technical education system of Korea badly or poorly satisfies their requirements for adequate technical manpower, while only 23.3% think that it fairly well satisfies their requirements.

TABLE 11.18

KOREAN FIRMS' ATTITUDES TOWARDS THE ABILITY OF THE TECHNICAL EDUCATION TO SATISFY INDUSTRY'S NEEDS

Category level (V359)	Absolute Freq. (No. of firms)	Relative Freq. (%)	Cumm Freq. (%)
Badly	1	3.3	3.3
Poorly	9	30.0	33.3
Neither well or bad	13	43.3	76.6
Fairly	7	23.3	100.0
Total	30	100.0	

Source: The output of SPSS (Crosstabulation Analysis) for question No.59.

Table 11.19 shows a relationship between the perceived capability of the technical education system to provide adequate labour, expressed by Korean firms (V359), relative to that of the general education system (V345). What can be noted here is that perceived capability of the technical education system to supply an adequately qualified manpower is less than that of the general education system. V345 is significantly correlated with V359 at 0.0174 significance level, with a high degree of association (Cramer's V = 0.507).

Only 23.3% of the 30 Korean firms are fairly well satisfied that the technical and general education systems supply an adequately qualified labour force for the plant and construction industry. We can note from the table that technical education is seen as less capable than the general education system by the Korean plant exporters and construction firms.

TABLE 11.19

A RELATIONSHIP BETWEEN CAPABILITY OF THE GENERAL EDUCATION SYSTEM AND ABILITY OF TECHNICAL EDUCATION TO MEET MANPOWER REQUIREMENTS OF INDUSTRY

Unit: number of firms, ( ) %

V359	Satisfaction ability of technical education				Row
V345	Badly	Poorly	Neutral	Fairly	Total
Fairly incapable	0(0.0)	4(13.3)	0(0.0)	0(0.0)	4(13.3)
Fairly capable	1(3.3)	4(13.3)	13(43.3)	5(16.7)	23(76.7)
Very capable	0(0.0)	1(3.3)	0(0.0)	2(6.7)	3(10.0)
Column Total	1(3.3)	9(30.0)	13(43.3)	7(23.3)	30(100)

Source: The output of SPSS (Crosstabulation Analysis) of V345 by V359.

Note: 1. V345 - Capability of the education system in general.

2. V359 - Ability of technical education to meet manpower requirements of plant and construction industry.

3. Raw chi square = 15.40, Sig. = 0.0174, Cramer's V = 0.507.

It seems useful to find out the reasons which explain such a high ratio of dissatisfaction. Table 11.20 presents these reasons as seen and ranked by Korean firms. The most important factor is the absence of a long-run national strategy for technical and vocational education. This is demonstrated by: 1) an inadequate admission policy; 2) the absence of long-term plans; 3) the absence of cooperation and coordination between technical institutes and industrial enterprises; and 4) the obsolescence and irrelevance of courses and training methods.

TABLE 11.20

REASONS ACCOUNTABLE FOR THE INADEQUACY OF TECHNICAL EDUCATION TO MEET QUALIFIED TECHNICAL LABOUR REQUIREMENTS

Variable Number	Reasons	Weighted Mean Score
V360	Lack of technical facilities in colleges and schools	5.464(3)
V361	Irrelevance of courses and teaching techniques	5.821(2)
V362	Traditional social values which regard technical education as second class	4.000(7)
V363	Funds allocated to technical education are inadequate	5.286(4)
V364	Absence of coordination between educational planners and decision makers in industry	5.214(5)
V365	Technical schools are limited in numbers	4.000(7)
V366	Poor qualifications of teachers	5.036(6)
V367	Absence of long-run strategy for technical and vocational education	5.929(1)

Source: The output of SPSS (Discriminant Analysis) for question No. 60. See Table 11.16.

Note: 1. The sample of Korean firms consists of 20 plant exporters and 8 construction firms.

2. Figures in brackets indicate ranking according to relative importance.

11.4.3 STANDARD OF RECENTLY APPOINTED TECHNICIANS

Finally, both Korean and non-Korean plant and construction firms were asked to evaluate the standard of recently graduated appointees employed by their firms.

In Table 11.21 the most significantly discriminated variable in this country comparison is V369 (technical competence), followed by V370 (academic knowledge) and V373 (social integration). In general, non-Korean firms appear to be far more satisfied with the standard of recently graduated appointees employed by their firms compared with those of Korean firms. In particular, non-Korean firms are quite satisfied with the level of technical competence and academic knowledge relative to their recently appointed technicians. In contrast, Korean firms are not satisfied with these two factors (mean score < 3.34). This result is consistent with that of Table 11.15.

TABLE 11.21

A COMPARISON BETWEEN KOREA AND 11 OTHER COUNTRIES REGARDING THE EVALUATION OF RECENTLY APPOINTED TECHNICAL LABOUR

		Weighted Mean Score	
Variable Number	Factor	Korea (a)	11 Other Countries(b)
* V369	Technical competence	2.857(4)	4.500(2)
* V370	Academic knowledge	3.333(3)	4.556(1)
V371	Originality	2.810(5)	4.056(3)
V372	Keeping work decipline	3.524(2)	4.000(4)
* V373	Social integration	3.786(1)	4.000(4)
V374	Dealing with problems	2.714(6)	3.944(6)

Source: The output of SPSS (Discriminant Analysis) for question No. 62. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: 5 (very satisfactory); 4 (quite satisfactory); 3 (neutral); 2 (quite unsatisfactory); and 1 (very unsatisfactory).

Note: 1. * represents significantly discriminated variable. Eigenvalue, canonical correlation, Wilks lambda and significance are 1.745, 0.797, 0.364 and 0.0000, respectively. Percent of grouped cases correctly classified: 88.3%.
2. (a) 42 companies (b) 18 companies, 11 countries.
3. Figures in brackets indicate ranking according to relative satisfaction level.

In the case of Korean firms, the high level of satisfaction with the social integration of their recently appointed technicians can be attributed to the fact that it is in the nature of the Korean worker to integrate himself socially into his work community very quickly. The three factors with mean scores < 3.000 are regarded as of a lower level of satisfaction, namely: technical competence (2.857); originality (2.810) and dealing with problems (2.714). It is obvious that these three factors represent the most important qualities which a technician should be equipped with. Low level of originality and technical competence can be seen as the outcome of an inadequate technical education system, inadequate resources, ineffective policies, a high level of academic orientation, an alienation from industrial careers and concentration on quantitative aspects rather than qualitative ones.

It can be seen from Table 11.22 that executives of capital-intensive firms tend to judge the technical competence of recently appointed technicians higher than those of labour-intensive firms. This is not surprising since capital-intensive technologies are generally associated with more complex production techniques and higher levels of technical skills.

As for evaluating appointees on the basis of their academic knowledge, technial originality and dealing with problems, the perceptions given and analysed seem to reflect the same trend of that of technical competence. However, Table 11.22 shows that capital-intensive firms tend to give lower assessment to those appointees regarding social integration. This may be because rigid work regulations associated with capital-intensive techniques and automation seem to cause lower levels of social integration of recently appointed technicians compared with labour-intensive ones. In other words, in addition to more relaxed and less rigid work regulations of labour-intensive techniques, appointees by labour-intensive firms are generally associated with a larger numbers of employees and social supervisory skills which encourage social integration.

TABLE 11.22

A RELATIONSHIP BETWEEN THE STANDARD OF RECENTLY APPOINTED TECHNICIANS EVALUATED BY KOREAN FIRMS AND TECHNOLOGY PATTERN USED BY THEM

Q62 V344	Technical Competence	Academic Knowledge	Originality	Work Discipline	Social Integration	Dealing with Problems
	(0.37) (0.29)	(0.44) (0.05)	(0.44) (0.03)	(0.44) (0.04)	(0.31) (0.65)	(0.37) (0.30)
Highly labour intensive	4.0	3.7	3.7	4.3	4.3	3.7
Fairly labour intensive	2.5	2.9	2.4	3.6	3.5	2.5
Balanced between labour & capital	3.5	3.8	3.6	3.6	4.0	3.3
Fairly capital intensive	3.7	3.8	3.2	4.2	3.8	2.8
Highly capital intensive	4.5	5.0	4.5	3.5	3.5	4.5

Source: Calculated from the output of SPSS (Crosstabulation Analysis) for question No. 55 by No. 62. Values are from 5 (very satisfactory) to 1 (very unsatisfactory).

Note: 1. Figures in brackets of the first and the second raw refer to Crammer's V and Significance, respectively, while those not in brackets indicate weighted mean scores.
2. Q62 - Standard of recently appointed technicians.
3. V344 - Technology pattern.
4. The sampe analysed above consists of 42 Korean firms.

Turning to work discipline, there is no significant difference between labour and capital-intensive firms in their evaluation of their recent appointees. However, labour-intensive firms seem to attribute slightly higher levels of satisfaction to this quality compared with capital-intensive ones.

11.5 TECHNOLOGY TRANSFER

Technology innovation plays a key role in economic development. Denison (1967) and Jorgenson (1979)*, for example, have claimed that, on the average, technological innovation was responsible for about one third of the growth in GNP in the United States between 1948 and 1969 (from Denison) and during the post-war period (from Jorgenson).

This section presents and discusses the topics associated with technology transfer, namely: a) definitions and concepts; b) channels for technology transfer; c) international trends; d) the current situation in Korea; and e) problems associated with technology transfer in Korea. The section concludes with a discussion of an empirical survey we have conducted of the technology transfer process.

11.5.1 DEFINITIONS AND CONCEPTS OF TECHNOLOGY TRANSFER

Definitions of Technology

The term "technology" is often linked with scientic and engineering knowledge which has been adopted and adapted for commercial use. Quinn (1969) defined technology as the application of science to the solving of well-defined problems and knowledge about physical relationships systematically applied to useful purposes. Strassman (1968) defined technology as:

> "not only tools, a stockpile of utensils, but a kind of tool-using behaviour, a set of methods for making specific goods".

Technology is defined in its broadest sense to mean knowledge or methods which are necessary to continue or to improve the existing production and distribution of goods and services. It includes entrepreneurial expertise and professional know-how.

It is obvious that technology is embodied in many forms: in human capital, physical capital, and in recorded information. The most important form in LDCs seems to be that element of technology which is embodied in human capital, a form which makes technology transfer difficult.

Concepts of Technology Transfer

The concept of "technology transfer" is rarely clearly defined. Different writers seem to employ different concepts leading to different and sometimes conflicting conclusions. Four concepts which are most often found in the literature may be used to clearly define technology transfer.

The first concept considers the geographical transfer of technology when it is used effectively in a new environment. For example, as long as new technology is employed efficiently, even if the whole factory is run by foreigners, technology is considered to have been successfully transferred.

Under the second concept, technology is said to have been transferred only when local labour can efficiently take charge of the imported technology. For example, technology transfer occurs when local workers have obtained the skill to operate machines correctly, to keep to a sophisticated maintenance schedule, to repair machines and so on.

According to the third concept, technology transfer occurs when technology spreads to other local productive units in the inducing nation (i.e. technology diffusion). This can take place in a number of ways, for instance, through the active dissemination efforts of the initial inducing enterprises, sub-licensing agreements, demonstration effects and so on.

When imported technology is fully understood by local workers and these workers begin to adapt the imported technology to the specific requirements of the local environment (i.e. technology adaptation and development), we can consider technology to have been transferred according to the fourth concept. In the most successful cases, local workers may discover and develop new techniques on the basis of imported technology.

11.5.2 CHANNELS FOR TECHNOLOGY TRANSFER

Technology can be diffused internationally through various methods. Generally speaking, two major methods can be regarded as channels for technology transfer. The first one can be termed "packaged transfer" or direct foreign investment, by which technology is tied to other inputs of production such as capital and management. In contrast, "unpackaged" channels include various arrangements which allow technology to be acquired independently of control and ownership of the sources of suppliers.

Unpackaged Channels for Transferring Technology

As for conventional technology and products, technology is readily transferred through published information such as books, journals, trade exhibitions and international conferences. When buying hardware, buyers generally receive technical services, and input suppliers sometimes grant technical and laboratory testing services or supply marketing assistance. Government research institutes can be considered to be unpackaged channels because of the possibility of their being adaptors and innovators of new technology. However, the most common means remains training and education conducted either locally or overseas.

Technology can also be acquired from various kinds of technology contracts with consultant firms in the developed countries, ranging from feasibility studies to the actual management of enterprises under contracts. LDCs commonly use turnkey contracts, by which technology suppliers are responsible for all technical decisions as well as installation. When certain key elements are patented, licensing agreements can be concluded to obtain access to trade secrets or to establish market goodwill.

Direct Foreign Investment

Direct foreign investment, which offers technology in one package with money capital and control, can take one of four basic forms: a) wholly-owned foreign subsidiaries; b) foreign controlled joint-ventures; c) locally controlled joint-ventures; and d) wholly-owned local firms.

Direct foreign investment can transfer technology via an "internal transfer" or an "external transfer". The former occurs when there is a flow of knowledge from foreign investors and experts to the local work force within foreign subsidiaries or foreign controlled joint-ventures. In contrast, the latter take place when trained local staff or skilled local entrepreneurs leave foreign subsidiaries or joint-ventures and take with them those fostered skills which cannot be appropriated by tranferors.

Internal transfer can occur at all levels within a firm through observation, on-the-job training or through formal training. Johnson (1970) has argued that since the costs of exporting skills from advanced countries are high, there is a profit motive for multinational corporations to train local staff. Joint-venture arrangements can also enhance entrepreneurial activities because they offer local entrepreneurs the opportunity to get industrial experience with reduced capital risks.

Foreign firms may also offer training and know-how to suppliers and customers. Reuber (1973) reported that foreign firms often found it necessary to train local dealers and distributors. Innovations or introduction of new technologies by foreign firms may force supplier firms in local industries to adopt more efficient techniques or conduct more effective quality control procedures.

However, an overdose of direct foreign investment may kill off young and inexperienced local firms. Since foreign firms are more efficient, they may eliminate local competitors by using aggressive pricing policies or introducing new low-cost technology not available to local firms. They may also compete with local firms for the most talented local staff by offering higher wages, thus stretching scarce resources rather than accumulating more human capital. Foreign firms may be successful in keeping the labour turnover rate low and, therefore, reduce the leakage in know-how. Cohen (1973) found that the spillover effect of training by American firms to Korean firms was minimal, but should they be international corporations, they might post talented local staff overseas, resulting in a brain drain and a loss to local firms of necessary human capital.

The larger the market and the more intense the competition, the more likely the local firms will be pressurised to observe, emulate and assimilate more efficient technology.

Direct foreign investment will give extra benefits to the host country only if foreign firms train more workers than they need. In short, the host country gains when external effects have occurred. Caves (1974) argues that:

> "The host nation's private sector does not benefit directly because the foreign subsidiary is efficient, or brings to its shores skilled entrepreneurship or productive knowledge. Rather its gains depend on spill-overs of productivity that occur when the multinational corporation cannot capture all quasi-rents due to its productive activities".

11.5.3 INTERNATIONAL TRENDS IN TECHNOLOGY TRANSFER

In technology markets the control exercised by technology exporters is tight, business-related technology information flows are closely regulated and transaction expenses tend to be high. Technology transfer is accomplished relatively smoothly among developed countries, but there are many constraints on technology transfer between developed and developing countries, some of which are due to restrictions and a reluctance to provide high technology on the part of developing countries.

This sub-section presents and discusses the trend of R & D (Reseach and Development) by major countries and the international trend of technology trade.

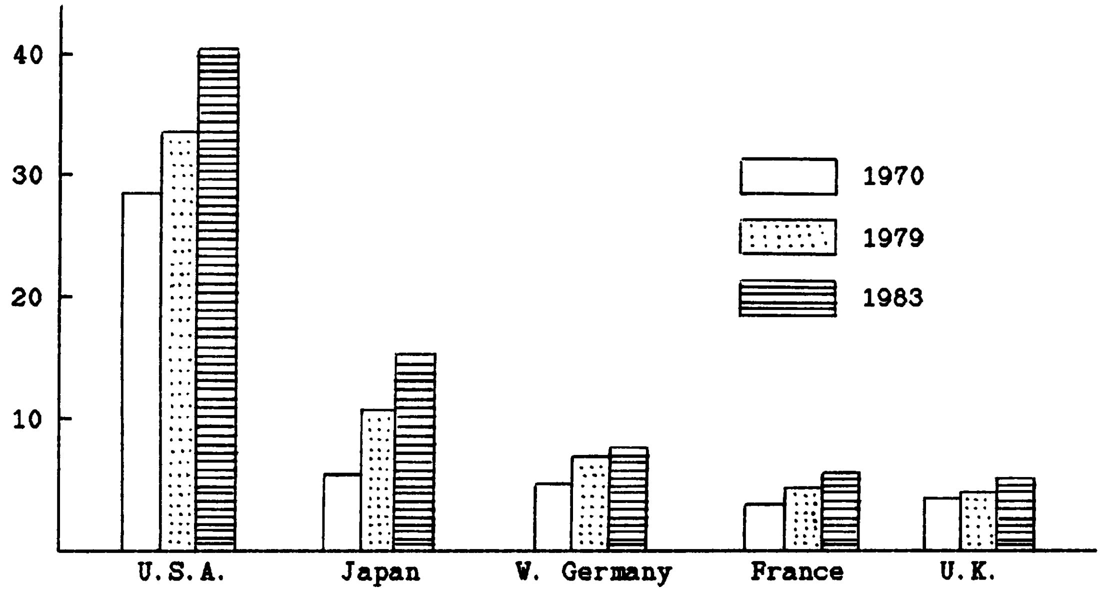
11.5.3.1 TREND OF RESEARCH AND DEVELOPMENT BY MAJOR COUNTRIES

As shown in Graph 11.6, the United States, the world's largest technology provider, has invested most in R & D among five developed

GRAPH 11.6

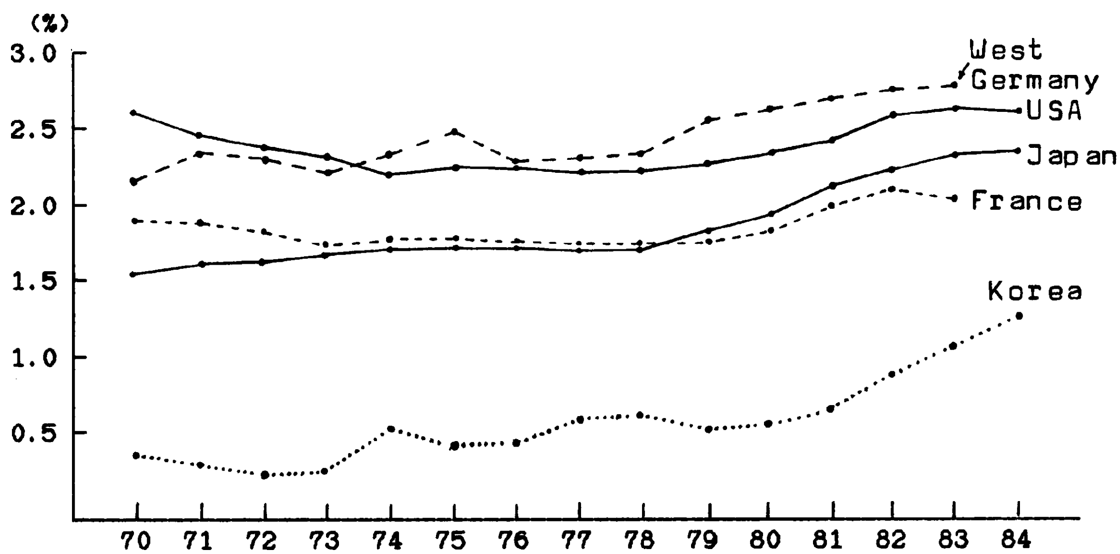
THE TREND OF R & D EXPENDITURES BY MAJOR COUNTRIES[1]

(Unit: Billion 1972 US dollars)



GRAPH 11.7

TRENDS IN THE RATIO OF R & D EXPENDITURES TO GNP BY MAJOR COUNTRIES[2]



Source: 1. Science and Technology Annual (1986), Ministry of Science and Technology, Seoul Korea, December 1986.
2. Industrial Technology White Paper (1986), Korea Industrial Research Institutes (KIRI), Seoul Korea, October 1986.

countries, followed by Japan and West Germany. But per capita, the ratio of R & D expenditures to GNP, West Germany has ranked first since 1974, followed by the United States and Japan (see Graph 11.7). In 1983 the ratio of R & D expenditure to GNP in Korea was about one-third of West Germany's, two-fifths of the US and half the ratio in France. However, the trend in the Korean ratio, from 0.64% in 1982 to 1.28% in 1984, indicates that Korea had begun by the 1980s to shift her industrial structure from a labour intensive to a more technology intensive one, and to narrow the technological gap with the developed countries and cope with relative price advantages enjoyed by LDC competitors. But Korea still falls behind the developed countries in the ratio of R & D expenditures to GNP. For Korea to remain competitive in world trade, it must not only continue to restructure its industry but also move up the technological ladder if it is not to lose export markets to others in the developing world. To this end the Korean government has announced plans to gradually increase investment in R & D to five percent of GNP. (Korea Newsreview, December 19, 1987).

11.5.3.2 COUNTRY COMPARISONS WITH REGARD TO THE INTERNATIONAL DISSEMINATION OF TECHNOLOGY

Technology Trade

Table 11.23 shows the technological balance of payments of five developed countries, including Korea, in terms of receipts and payments, balances and ratios of receipts to payments.

The US economy enjoys an exceptional situation with regard to the balance as well as the ratio of receipts to payments, revealing that the

US is undoubtedly the major centre for the dissemination of technology. In addition to the US, only the UK shows a positive balance, but neither this nor its ratio is commensurate with that of the US.

TABLE 11.23

TECHNOLOGICAL BALANCE OF PAYMENTS BY MAJOR COUNTRIES[1]

Unit: Millions 1975 US dollars

	1972				1982			
	Receipts R	Payments P	Balance B	R/P (%)	Receipts R	Payments P	Balance B	R/P (%)
USA	3214.8	368.3	2846.4	873.0	4130.9	202.4	3928.5	2041.0
Japan	226.5	934.0	-707.5	24.2	526.5	804.7	-278.2	65.4
FRG	270.4	631.6	-361.1	42.8	342.1	679.5	-337.4	50.3
France	302.8	460.8	-158.0	65.7	552.4	644.2	- 91.9	85.7
UK	563.9	511.0	52.9	110.3	610.9	463.6	147.2	131.8
Korea[2]	--	--	--	--	18.2[a]	115.7[a]	- 97.5	15.7

Source: 1. Madeuf, B. (1986), "Trends in Technological Competitiveness within the OECD, 1970-80," <u>OECD Science and Technology Indicators</u>, OECD, Paris, 1986.

2. <u>Industrial Technology White Paper (1986)</u>, Korea Industrial Research Institutes (KIRI), Seoul Korea, October 1986.

Note: a. based on USM$ 1982 (not 1975).

With respect to receipts and payments, the most significant changes are: the increase in the receipts of Japan and France (increases of 132.5% and 82.4%, respectively); the increase in the payments of France and Germany (by 39.8% and 7.5%, respectively); and the fall in the payments of Japan, the UK and the US (by 13.8%, 9.3% and 45.0%, respectively). In sum, Japan and Germany have switched rankings as centres for the dissemination of technology.

Other observations can be made, as follows:

(a) Due to increased receipts and lower payments, ratios have improved in Japan, the USA and the UK. The trend in Japan resulted in reduced dependence on foreign technology and a larger role in dissemination;

(b) The improved ratio in the UK is associated with a slight increase in receipts and a slight decrease in payments;

(c) A marginal improvement in the ratio in Germany is due to an increase in receipts relative to payments, and the improvement in France arises from a much greater increase in receipts than in payments;

(d) Korea has the least favourable ratio of receipts to payments (15.7%).

In particular, we should note that Japan has succeeded in narrowing the technological gap with the US, having cast off her initial stage of imitation, and has developed into a nation of technology innovation. Nevertheless, her rate of technology absorption has shown only a gradual increase (see Table 11.24).

TABLE 11.24

ANNUAL TREND OF TECHNOLOGY TRANSFER IN JAPAN

Year	1950	1960	1970	1980	1981	1982	1983
Number of technology inflows	76	588	1768	2142	2076	2229	2212

Source: Korea Institute for Economics and Technology (KIET), "International Workshop on Technology Transfer among Developing Countries (TTADC-6)," December 1985, Seoul Korea.

The major industries to develop a technology base in Japan have been, in order, electricity, electronics, machinery, textiles and chemicals, which together account for 70.0% of the inflow of technology. It is also apparent that technology transfer to Japan is heavily dependent on the United States (see Table 11.25).

TABLE 11.25

ANNUAL TECHNOLOGY INTRODUCTIONS (BY COUNTRY) TO JAPAN

Unit: Number of technology inflows, ( )%

Year / Country	1979	1980	1981	1982	1983
U.S.A.	1171 (55.3)	1092 (51.0)	977 (47.1)	1175 (52.7)	1183 (53.5)
France	214 (10.1)	230 (10.7)	224 (10.8)	228 (10.2)	243 (11.0)
FRG	186 (8.8)	228 (10.6)	219 (10.5)	226 (10.1)	210 (9.5)
U.K. & Others	545 (25.8)	592 (27.7)	656 (31.6)	600 (26.9)	576 (26.0)
Total	2116 (100)	2142 (100)	2076 (100)	2229 (100)	2212 (100)

Source: Table 11.24.

Another notable feature in Japanese technology transfer is a sharp increase in in-house R & D expenditures in parallel with an increase in the inflow of technology. As a result, Japan now exceeds the United States and European countries in the field of applied technology, development and commercialisation. In 1983, the ratio of R & D expenditures to GNP was 2.33%, which was the third highest after West Germany and the USA (see Graph 11.7).

Dependency on Foreign Technology

Payments for technology in a country's external account (i.e. the import of technology) may be considered as a yardstick of its dependence on external sources of technology. Similarly, technological receipts provide a rough estimate of a country's technological competitiveness.

Table 11.26 shows the rate of dependency on foreign technology between 1966 and 1980. The rate of dependency on foreign technology can be expressed as follows:

$$\frac{\text{royalties paid for foreign technology (A)}}{\text{cost of research and development + (A)}}$$

Calculations of these rates enable the absolute and relative data to be weighted by the size of R & D budgets. This reduces the effects of differences in the size of national economies to show a countries technical competence.

TABLE 11.26

THE RATE OF DEPENDENCY ON FOREIGN TECHNOLOGY[1]

Unit: %

Year / Country	1966	1969[2]	1970	1975	1978	1980
U.S.A.	0.64	1.00	0.86	1.33	1.25	1.24
U.K.	5.39	14.00	8.95	9.25	8.25	---
FRG	7.34	16.00	7.01	6.78	6.10	5.12
France	9.83	---	11.51	14.49	15.55	---
Japan	12.47	---	11.47	7.46	6.82	6.51
Korea	---	---	---	17.15	16.89	18.22

Source: 1. Korea Institute for Economics and Technology (KIET), "International Workshop on Technology Transfer among Developing countries (TTADC-6)," December 1985, Seoul Korea.
2. Madeuf, B. (1986), "Trends in Technological Competitiveness within the OECD, 1970-80," <u>OECD Science and Technology Indicators</u>, OECD, Paris, 1986.

Note: --- Data not available.

In Table 11.26, the United States is shown to be the country least dependent on foreign technology (with a rate < 2.0%), followed by Germany and Japan, which have reduced their dependence on foreign technology. In contrast, France has increased her dependency since 1966. Korea has depended most on foreign technology with a dependency rate of more than 18.0%, much higher than the 6.5% rate in Japan and 1.24% rate in the United States.

11.5.4 CURRENT SITUATION OF TECHNOLOGY TRANSFER IN KOREA

This sub-section will present and discuss technology transfer in Korea in terms of: a) current policy relative to technology transfer; b) the change in the source of technology inflows by country and industry; c) technology exports; and d) problems of technology transfer in Korea.

11.5.4.1 CURRENT POLICY RELATIVE TO TECHNOLOGY TRANSFER

It was not until 1962, the initial year of Korea's First Five-year Economic Development Plan, that technology transfer began to be sourced on a commercial basis. At that time, the Korean government depended largely upon foreign sources of finance for economic development, channeled via the Foreign Capital Introduction Act which provided the funds for technology transfer.

In the initial stage, the Korean government severely restricted technology inflows via foreign currency controls in the interests of domestic industry protection. With the progress of Korea's technological capability, however, the Korean government undertook step-by-step liberalisation policies in five sequences beginning in 1962. Such efforts led to the amendment of the Foreign Capital Introduction Act in July 1984, whereby an "approval" system was replaced by a "reporting" system. In addition, to promote technology transfer inflows, companies became exempt from income tax or corporation tax for five years after the introduction of foreign technology. However, a technology inflow is still prohibited in cases where: (a) the major purpose is simply to acquire a design, trademark, or exclusive sales rights; (b) the major purpose lies in sales of spare parts or gadgets of original property; and (c) unfairness is obvious as to the contract or agreement concluded with foreign concerns.

Until 1986 the purchase of low quality, obsolescent technology was also prohibited and foreign trademarks were permitted only when accompanied by the technology. However, since July 1986, by amendment to the pertinent laws, the Korean government has allowed the use of trademarks and the introduction of out-of-date technology.

11.5.4.2 THE CHANGE IN TECHNOLOGY INFLOWS BY COUNTRY AND INDUSTRY

Annual Trend of Technology Introduction in Korea

Table 11.27 shows the annual trends in the number of technology introductions and royalty payments.

The total number of the technologies introduced from 1962 through 1985 was 3538; the total amount of royalties paid from 1962 to 1987 was approximately US 2,160 million dollars. As shown in the table, in step with industrial development and in response to liberalisation, the demand for foreign technology increased rapidly. Thus, the total number of technology inflows from 1981 to 1985 was 1808. This amounted to 51.0 % of the total technology introductions and 84.0 % of the total amount of the royalty payments over the period 1981-1987. In particular, the sharp rise of royalty payments in 1986 and 1987 is indicative of efforts by Korean firms to introduce costly advanced technology in a bid to boost the competitive edge of their products following the July 1986 amendments to the law.

TABLE 11.27

ANNUAL TREND OF ROYALTY PAYMENTS BY KOREA[1]

Unit: USM$, ( ) number of cases

Year	62-80	81	82	83	84	85	86[2]	87[2]	Total
Royalties	344.3	107.1	115.7	149.5	213.2	295.5	411	523	2159.3
No of cases	(1730)	(247)	(308)	(362)	(437)	(454)	(-)	(-)	(3538)

Source: 1. The status of contracts relative to technology introduction (1962-85), Korea Industrial Research Institutes, July 1986.
2. Korea Newsreview, June 25, 1988, Vol. 17, No. 26.
Note: - Data not available.

The Change in Technology Inflows by Country

Table 11.28 presents the change in technology inflows by country in Korea from 1962 to 1985.

The number of introductions from the United States was 824, with the amount of royalty payments being USM$ 600.0, while the number of introductions from Japan was 1935, with royalty payments of USM$ 397.7. Thus, the total number of introductions from and the total amount of the royalty payments to the US and Japan equated to 78.0% of all introductions and 74.5% of all royalty payments, respectively.

TABLE 11.28

THE CHANGE IN TECHNOLOGY INTRODUCTION BY COUNTRY IN KOREA (1962 - 1985)

Unit: USM$, ( ) %

Year	Total		1962 - 82		1983		1984		1985	
Country	Cases	Value	Cases	Value	Cases	Value	Cases	Value	Cases	Value
Total	3538 (100)	1338.8 (100)	2285	680.6	362	149.5	437	213.2	454	295.5
U.S.A.	824 (23.3)	600.0 (44.8)	534	248.3	77	80.8	99	116.1	114	154.8
Japan	1935 (54.7)	397.7 (29.7)	1289	232.9	201	37.1	217	53.1	228	74.6
West Germany	192 (5.4)	52.1 (3.9)	107	25.1	20	3.8	36	11.6	29	11.6
U.K.(1)	132 (3.7)	-- (--)	84	--	13	--	14	--	21	--
France	109 (3.1)	33.4 (2.5)	62	19.5	10	2.7	23	3.7	14	7.6
Others	346 (9.8)	255.7 (19.1)	209	154.9	41	25.2	48	28.6	48	47.0

Souce: The status of contracts relative to technology introduction (1962 - 85), Korea Industrial Research Institutes, Seoul Korea, July 1986.

Note: (1). Payment value to the U.K. is included in that of others.
(2). ( ) share ratio.

Since the number of technology introductions from the US is smaller than from Japan, while the amount of royalties paid to the US is larger than to Japan, the technology introduced from the US can clearly be regarded as of a higher level.

According to recent official statistics, the reliance of Korean firms on US business partners sharply increased in the 1980s. During the 1982-1987 period, royalties paid to US firms totalled USM$ 842.6 (49.3% of the total). It has been conjectured by the Korean government that royalty payments to US firms will increase further in the years ahead as a result of the worsening disputes between the US and Korea on the protection of intellectual property rights (Korea Newsreview, June 25, 1988).

Technology Inflow by Industry

Table 11.29 shows the technology inflow according to industry. The mechanical, electrical and electronics, petrochemical and metallic industries absorbed more than 70.0% of the technology cases introduced and made 64.0% of the royalty payments in the period 1962-85. The number of technology introductions in these industries tended to increase year by year, suggesting that the introductions were beneficial to their development (see Table 11.30). However, in the construction industry there were only 67 cases and royalty payments of USM$ 28.1 over the same period.

TABLE 11.29

THE TECHNOLOGY INFLOW BY INDUSTRY AND COUNTRY (1962-85)

Unit: USM$, ( ) %

Country / Industry	Total Cases	Total Value	U.S.A.	Japan	West Germany	U.K.	France	Others
Total	3538 (100)	1338.8 (100)	824 (100)	1935 (100)	192 (100)	132 (100)	109 (100)	346 (100)
Petro-chemical industry	565 (16.0)	284.1 (21.2)	133 (16.1)	336 (17.4)	20 (10.4)	23 (17.4)	17 (15.6)	36 (10.4)
Metallic	270 (7.6)	83.3 (6.2)	44 (5.3)	165 (8.5)	9 (4.7)	16 (12.1)	6 (5.5)	30 (8.7)
Electrical & electronics	701 (19.8)	241.3 (18.0)	202 (24.5)	413 (21.3)	28 (14.6)	5 (3.8)	8 (7.3)	45 (13.0)
Machinery	976 (27.6)	252.5 (18.9)	166 (20.1)	598 (30.9)	72 (37.5)	50 (37.9)	20 (18.3)	70 (20.2)
Construction	67 (1.9)	28.1 (2.1)	20 (2.4)	28 (1.4)	--	5 (3.8)	1 (0.9)	13 (3.8)
Others	959 (27.1)	449.7 (33.6)	259 (31.4)	395 (20.4)	63 (32.8)	33 (25.0)	57 (52.3)	152 (43.9)

Source: Table 11.28.

Note: 1. Figures in country columns indicate number of cases introduced.
2. ( ) share ratio.

TABLE 11.30

THE TREND IN TECHNOLOGY INTRODUCTION TO MAJOR INDUSTRIES (1982-85)

Unit: ( ) %

Year		1982	1983	1984	1985	Total
Number of	A	190	233	286	339	1048
cases	B	308	362	437	454	1561
	A/B	(61.7)	(64.4)	(65.4)	(74.7)	(67.1)
Royalty	A	69.6	82.7	136.9	172.2	461.4
payments	B	115.7	149.5	213.2	295.5	773.9
(USM$)	A/B	(60.2)	(55.3)	(64.2)	(58.3)	(59.6)

Source: Table 11.28.
Note: A; Electrical & electronic, mechanical, petro-chemical and metallic industries.
B; Total number of cases and total amount of royalties paid.

11.5.4.3 TECHNOLOGY EXPORTS OF KOREA

Table 11.31 shows technology exports by year. The amount of technology exports in 1985 aggregated to USM$ 11.3 from seven cases, revealing a declining trend in both cases and export receipts since 1983. This may be attributed to a more active Korean government policy favouring inward technology flows from developed countries rather than the sale of technology to potential rivals in the newly industrialised countries.

TABLE 11.31

TECHNOLOGY EXPORTS BY YEAR

Year	1978 - 80	1981	1982	1983	1984	1985
Number of cases	20	6	11	11	6	7
Receipts (USM$)	8.1	11.8	18.2	18.9	16.9	11.3

Source: Industrial Technology White Paper (1986), Korea Industrial Research Institutes (KIRI), Seoul Korea, October 1986.

Table 11.32 presents the technology balance of payments of Korea in terms of receipts and payments, balances and ratios of receipts to payments from 1981-85.

The deficit in the technology balance of payments has increased year by year, which is reflected in the changes in the ratio of receipts from technology exports to royalty payments (at least since 1982). This data demonstrates the increasing dependence of the Korean economy on foreign technology to sustain its development.

TABLE 11.32

TECHNOLOGY BALANCE OF PAYMENTS IN KOREA (1981 -1985)

Unit: US$M

Year	1981	1982	1983	1984	1985	Total
Receipts (R)	11.8	18.2	18.9	16.9	11.3	77.1
Payments (P)	107.1	115.7	149.5	213.2	295.5	881.0
Balance	-95.3	-97.5	-130.6	-196.3	-284.2	-803.9
R/P (%)	10.4	15.7	12.6	7.9	3.8	8.8

Source: Table 11.31.

11.5.4.4 THE PROBLEMS OF TECHNOLOGY TRANSFER IN KOREA

Technology transfer to Korea is high in comparison with that of the NICs, such as Taiwan (see Table 11.33).

Technology transfer to Korea has a number of other characteristics worthy of mention, as follows:

(a) Korea has been heavily dependent on the United States and Japan, and has neglected European suppliers.

TABLE 11.33

COMPARISON WITH TAIWAN'S TECHNOLOGY INTRODUCTION

Unit: number of cases

Year	1962 - 1981	1982	1983	1984	Total
Korea	1977	308	362	437	3084
Taiwan	1585	144	141	168	2038

Source: Table 11.24

(b) Most technologies are purchased indirectly. In particular, Japanese firms play an intermediary role, providing the engineering and production equipment and materials for manufacturing facilities in which the technology is embodied. The import of unpackaged technology through the licensing of patents has seldom occurred.

(c) Although a typical contract calls for information on the final design specification, assembling procedures and quality control, most imported technologies consist largely of the introduction of basic know-how.

(d) There is much duplication through imports of similar or identical technologies.

(e) The demand for foreign technology reflects in part a lack of confidence in in-house R & D capability. Therefore, even simple techniques, which are fully within the capability of Korean firms, are imported so as to enhance public acceptance of the final products.

(f) The import of foreign technology tends to be secondary to the import of foreign capital. That is to say, foreign technology has been accepted in order to secure foreign capital.

(g) Because of the acceptability of foreign technology and of preferential loans for its purchase, the majority of Korean firms have failed to develop their own research and development.

(h) Even though the Korean government shifted from an "approval" to a "reporting" system and adopted more simplified procedures in July 1984, regulation and inspection procedures continue to delay technology inflows.

(i) There are few supporting systems for diffusion (particularly from large enterprises to small and medium ones) of domestically developed technology. There is also little incentive to firms to adapt and improve the introduced technologies. In addition, the linkage between the domestic development of technology and introduced technology is very weak.

11.5.5 ATTITUDES OF PLANT EXPORTERS AND CONSTRUCTION FIRMS TOWARDS TECHNOLOGY

This sub-section presents and analyses the findings of our survey on the attitudes of the responding executives of Korean and non-Korean firms towards technology with respect to: a) the level of their technology; b) their technological level relative to Korean plant exports; c) the degree of competition in plant and construction exports; d) methods of technology transfer; and e) sources of technology and know-how.

11.5.5.1 THE LEVEL OF TECHNOLOGY USED BY KOREAN AND NON-KOREAN FIRMS

As shown in Table 11.34, non-Korean firms appear to have used a fairly sophisticated technology (with a mean score of 4.316) and Korean firms a conventional or fairly unsophisticated one, pointing to a relative weak competitive power of Korean firms in technological competence. This may be partly due to more active and strenuous efforts to upgrade the quality of products through the introduction of technology and in-house R & D investments in non-Korean firms compared with Korean firms (see Graph 11.7 and Table 11.23). It may be implied from Table 11.34 that non-Korean firms utilise more capital-intensive technology compared with Korean firms. This inference might be supported by the output of SPSS (Crosstabulation Analysis) for question No. 55, in which only 3 (11.3 %) of the 29 Korean firms and 6 (54.5 %) of 11 non-Korean firms claimed that they mainly employ a capital-intensive technology.

Variable V323 (see Table 11.34) has a quite strong discriminant power and there is a significant difference in the respective country group centroids at 0.0000 significance level, with 53 (88.3%) of 60 observations being correctly classified.

TABLE 11.34

A COUNTRY COMPARISON BETWEEN KOREA AND OTHER COUNTRIES WITH REGARD TO THE LEVEL OF TECHNOLOGY COMPARED WITH DEVELOPED COUNTRIES

Variable Number	Factor	Weighted Mean Score	
		Korea(a)	Others(b)
* V323	The level of technology compared with developed countries used by Korean and non-Korean firms	2.756	4.316

Source: The output of SPSS (Discriminant Analysis) for question No. 52. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: 5 (very sophisticated); 4 (fairly sophisticated); 3 (conventional); 2 (fairly unsophisticated); and 1 (very unsophisticated).

Note: 1. * represents significantly discriminated variable. Eigenvalue, canonical correlation, Wilks lambda and significance are 1.065, 0.718, 0.484 and 0.0000, respectively. Percent of grouped cases correctly classified: 88.3%.

2. (a) 41 companies (b) 19 companies, 11 countries.

The industry group results are not discussed because V323 has a weak discriminant power (canonical correlation coefficient: 0.217) and the significance level is over 0.10.

11.5.5.2 THE TECHNOLOGICAL LEVEL OF KOREAN PLANT EXPORTS

The technological level in the production phases of Korean plant exports is portrayed in Table 11.35. First, with respect to the ability to win orders (which is likely to have a multi-functional dependency, such as sales ability and information collecting ability), Korean firms believe themselves to be below standard compared with that of major advanced countries (with a mean score of 2.136). In contrast, non-Korean firms evaluate the ability of Korean plant exporters to win orders to be at an almost similar level to advanced countries. This variable, which makes a major contribution to the failure ratio of foreign tenders, is an expression of limited knowledge of local market conditions, prices etc.

Engineering ability becomes the major consideration in the export of technological services. Because the fields associated with plant construction include such areas as project planning, design, consultancy, test running and efficiency guarantees, it is important to improve their technological level in order to improve overall plant export performance. With respect to engineering ability, which consists of feasibility studies, design ability, consultancy and specification, Korean firms believe themselves to be much inferior to that of developed countries (with a mean score or 1.688), while non-Korean firms were slightly above standard (with a mean score of 2.50). In the case of the

TABLE 11.35

THE TECHNOLOGICAL LEVEL RELATIVE TO KOREAN PLANT EXPORTS ESTIMATED BY KOREAN AND NON-KOREAN FIRMS

Variable Number	Factor	Weighted Mean Score	
		Korea(a)	Others(b)
* V333	**Orders received**	**2.136(4)**	**2.833(2)**
V334	Sales ability	2.321	2.714
* V335	Information collection	2.179	2.833
V336	**Engineering**	**1.688(5)**	**2.500(5)**
V337	Feasibility studies	2.143	2.600
* V338	Design ability	1.714	2.600
V339	Consultancy	1.462	2.400
* V340	Specification	1.889	2.400
* V341	**Machinery production**	**2.333(3)**	**3.000(1)**
V342	**Parts production by sub-contractors**	**2.370(2)**	**2.750(3)**
V343	**Plant construction**	**2.741(1)**	**2.714(4)**

Source: Calculated from the output of SPSS (Crosstabulation Analysis) for question No. 54. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: 4 (the highest level); 3 (similar level to developed countries); 2 (below standard); and 1 (initiation phase).

Note: 1. (a) The sample of Korean firms consists of 22 in V333, 28 in V334, V335, V337 and V338, 16 in V336, 26 in V339 and 27 in from V340 to V343.
(b) The sample of non-Korean firms consists of 6 in V333 and V335, 7 in V334 and V343, 2 in V336, 5 in from V337 to V340, and 4 in V341 and V342.
2. Figures in brackets indicate ranking according to relative level of technology.

Note: 1. * represents significantly discriminated variable based on discriminant analysis. Eigenvalue, canonical correlation, Wilks lambda and significance are 0.947, 0.697, 0.514 and 0.0235, respectively. Percent of grouped cases correctly classified: 93.75%.
2. The sample firms in discriminant analysis are (a) 22 and (b) only 2, respectively.

feasibility study, which is the key to the eventual success of large projects, both Korean and non-Korean firms consider the ability of Korean firms to be above standard. In general, the design field is divided into basic design and detailed design. It has been indicated elsewhere in the study that Korean firms cannot help but depend on foreign, advanced technology for their basic design. In the view of non-Korean firms, however, the design ability of Korean plant exporters is considered to be only slightly inferior to that of advanced countries. Nevertheless, a major improvement in design ability would seem to be necessary before Korean firms can compete successfully for turnkey projects.

The consultant's role in this study is limited to engineering and works management. Weak consultancy skills, as a consequence of a lack of experience in high technology engineering work, has increased the difficulty of promoting technological service exports. According to the survey results, the consultancy skills of Korean firms are much inferior to those of advanced countries (with a mean score of only 1.462). In the case of specification, a field which is closely connected to consultancy, this general pattern is repeated.

Turning to machinery and parts production, Korean firms consider their ability to produce machinery and parts to be fairly inferior to that of developed countries, while non-Korean firms consider Korean firms' ability in this regard to be at a similar level or slightly inferior.

Finally, the plant construction field receives the highest competitive ranking among the various production phases of plant exports by Korean firms, but only the fourth highest by non-Korean firms, albeit with a similar mean score.

On the whole, both Korean and non-Korean firms believe the technological level of Korean plant exporters in all the production phases to be inferior to that of developed countries except in the machinery production field in the case of non-Korean firms (with a mean score of 3.00).

11.5.5.3 THE DEGREE OF COMPETITION IN PLANT AND CONSTRUCTION EXPORTS

Tables 11.36 and 11.37 show a country comparison between Korean and non-Korean firms and an industry comparison between plant exporters and construction firms, respectively, with regard to the degree of competition in the plant and construction export sector in which they operate.

TABLE 11.36

A COUNTRY COMPARISON BETWEEN KOREA AND OTHER COUNTRIES WITH REGARD TO THE DEGREE OF COMPETITION IN PLANT AND CONSTRUCTION EXPORTS

Variable Number	Factor	Weighted Mean Score	
		Korea(a)	Others(b)
* V376	The degree of competition in plant and construction exports	2.732	3.474

Source: The output of SPSS (Discriminant Analysis) for question No. 63. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: 4 (strongly competitive); 3 (competitive); 2 (slightly competitive); and 1 (uncompetitive).

Note: 1. * represents significantly discriminated variable. Eigenvalue, canonical correlation, Wilks lambda and significance are 0.344, 0.506, 0.744 and 0.0000, respectively. Percent of grouped cases correctly classified: 76.7%.

2. (a) 41 companies (b) 19 companies, 11 countries.

According to our survey results in Table 11.36, non-Korean firms appear to have experienced more competitive situations in plant and construction export markets than have Korean firms (with a mean score of 3.474). This may be attributable to a more active export strategy among non-Korean firms in order to increase their sales growth and market share growth compared with Korean firms. In addition to this, non-Korean firms may have been challenged by firms from NICs, which have a comparative advantage in terms of price competition.

The variable has a moderate discriminant power because of the canonical correlation with a medium size of 0.506 and there is significant difference in country group centroids at 0.0000 significance level, with 46 (76.7%) of 60 observations being correctly classified.

TABLE 11.37

AN INDUSTRY COMPARISON BETWEEN PLANT EXPORTERS AND CONSTRUCTION FIRMS REGARDING THE DEGREE OF COMPETITION IN PLANT AND CONSTRUCTION EXPORTS

Variable Number	Factor	Weighted Mean Score	
		Plant (a)	Construction (b)
* V376	The degree of competition in plant and construction exports	2.731	3.125

Source: Table 11.36

Note: 1. * represents significantly discriminated variable.
Eigenvalue, canonical correlation, Wilks lambda and significance are 0.091, 0.288, 0.917 and 0.0283, respectively.
Percent of grouped cases correctly classified: 56.9%.
2. (a) 26 companies (b) 32 companies.

In Table 11.37, construction firms appear to have experienced a slightly more competitive situation than have plant exporters (with a mean score of 3.125). This may be due to a depressed oil market, in consequence of which clients have frequently posponed or cancelled potentially unprofitable projects, resulting in few orders in construction markets.

The variable has a fairly weak discriminant power and there is a significant difference in the respective industry group centroids at 0.0283 significance level, with 33 (56.9%) of 59 observations being correctly classified.

11.5.5.4 METHODS OF TECHNOLOGY TRANSFER

Technology can be disseminated through various methods. In general, two major methods can be regarded as routes for technology transfer, namely, "packaged transfer" (or direct foreign investment) and "unpackaged" routes.

Table 11.38 shows a country comparison with regard to methods of technology transfer. Korean firms regard direct purchase of technology patents (V380) as the most important method of technology transfer (with a mean score of 4.615), followed by licence agreements. In contrast, non-Korean firms regard joint-ventures (V381) as the most important method and V380 as the least important one (with a mean score of 4.333 and 1.833, respectively). This may be due to a sharp increase in the demand for core technology in Korea as Korean industries become more sophisticated and technological levels improve. Non-Korean firms may regard joint-ventures as the most important method of technology transfer because this mode allows them to cope with tariff and non-tariff barriers from LDCs.

TABLE 11.38

A COUNTRY COMPARISON BETWEEN KOREA AND OTHER COUNTRIES WITH REGARD TO METHOD OF TECHNOLOGY TRANSFER

Variable Number	Method of Technology Transfer	Weighted Mean Score	
		Korea(a)	Others(b)
* V377	Import of capital goods	2.833(6) @2.467(6)	3.000(4) @4.000(2)
V378	Transfer of a complete package	2.917(5) @3.067(5)	3.429(3) @3.250(4)
V379	Transfer of each component in package	3.375(4) @3.267(4)	3.750(2) @4.250(1)
* V380	Direct purchase of technology patents	4.615(1) @4.133(1)	1.833(6) @1.750(6)
V381	Joint-Ventures	3.941(3) @3.467(3)	4.333(1) @4.000(2)
* V382	Licence agreements	4.176(2) @4.133(1)	2.556(5) @2.000(5)

Source: Calculated from the output of SPSS (Crosstabulation Analysis) for question No. 64. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: 6 (the only method); 5 (the main but not sole); 4 (the second in importance); 3 (the third in importance) ; 2 (the fourth in importance); and 1 (the fifth in importance).

Note: 1. (a) The sample of Korean firms consists of 12 in V377 and V378, 16 in V379, 13 in V380 and 17 in V381 and V382.
(b) The sample of non-Korean firms consists of 6 in V377 and V380, 7 in V378, 8 in V379 and 9 in V381 and V382.
2. Figures in brackets indicate ranking according to relative importance of the method used.

Note: 1. @ represents the output of SPSS (Discriminant Analysis).
2. * represents significantly discriminated variable based on discriminant analysis. Eigenvalue, canonical correlation, Wilks lambda and significance are 1.146, 0.731, 0.466 and 0.008, respectively. Percent of grouped cases correctly classified: 86.36%.
3. The sample firms in discriminant analysis are (a) 15 and (b) 4, respectively.

Table 11.39 presents the trend in the transfer of technology to Korea via patent rights. The general trend shows that the direct purchase of technology patents is increasingly favoured relative to alternative transfer modes.

TABLE 11.39

THE TREND OF TECHNOLOGY INTRODUCTION MEASURED BY PATENT RIGHTS IN KOREA

Unit: number of cases, ( ) %

Year	1962 - 80	1981	1982	1983	1984	1985
A	1730	247	308	362	437	454
B	366	132	163	196	187	242
A/B	(21.2)	(53.4)	(52.9)	(54.4)	(43.3)	(53.3)

Source: Industrial Technology Wite Paper (1986), Korea Industrial Research Institutes (KIRI), Seoul Korea, October 1986.

Note: A; Total number of cases introduced.
B; Number of cases accompanied by patent rights.

An industry comparison between plant exporters and construction firms is portrayed in Table 11.40. Plant exporters consider direct purchase of technology patents (V380) to be the most important method of technology transfer (with a mean score of 4.909), followed by licence agreements; while construction firms favour joint-ventures (with a mean score of 4.533), followed by the transfer of components in a package. In particular, it should be noted that construction firms regard V380 as the least important method of technology transfer (with a mean score of 2.125). This may be because the plant industry is more heavily dependent than the construction industry on process management and skilled technicians to produce machinery, tools, and software parts and to operate and construct work on-the-spot. Consequently, the plant industry requires more technology patents than does the construction industry.

In contrast, construction firms consider joint-ventures to be the most important method of technology transfer. This may be attributable to the growth in construction activities by native firms in the Middle-

TABLE 11.40

AN INDUSTRY COMPARISON BETWEEN PLANT EXPORTERS AND CONSTRUCTION FIRMS WITH REGARD TO THE METHOD OF TECHNOLOGY TRANSFER

Variable Number	Method of Technology Transfer	Weighted Mean Score	
		Plant (a)	Construction (b)
V377	Import of capital goods	3.000(6) @2.700(6)	2.778(5) @2.889(5)
V378	Transfer of a complete package	3.111(5) @3.200(3)	3.100(4) @3.000(4)
V379	Transfer of each component in package	3.273(4) @3.200(3)	3.692(2) @3.778(2)
* V380	Direct purchase of technology patents	4.909(1) @4.400(1)	2.125(6) @2.778(6)
V381	Joint-Ventures	3.455(3) @3.200(3)	4.533(1) @4.000(1)
V382	Licence agreements	4.077(2) @4.100(2)	3.154(3) @3.222(3)

Source: Table 11.38

Note: 1. (a) The sample of plant exporters consists of 9 in V377 and V378, 11 in V379, V380 and V381 and 13 in V382.
(b) The sample of construction firms consists of 9 in V377, 10 in V378, 13 in V379 and V382, 8 in V380 and 15 in V381.
2. Figures in brackets indicate ranking according to relative importance of the method used.

Note: 1. @ represents the output of SPSS (Discriminant Analysis).
2. * represents significantly discriminated variable based on discriminant analysis. Eigenvalue, canonical correlation, Wilks lambda and significance are 0.312, 0.488, 0.762 and 0.034, respectively. Percent of grouped cases correctly classified: 75.00%.
3. The sample firms in discriminant analysis are (a) 10 and (b) 9, respectively.

East, which has required foreign contractors, by legislation, to offer not less than 20.0% of the value of a contract to local joint venture partners since 1983 (particularly in Saudi-Arabia). Thus, local Saudi construction firms have become more involved in Saudi construction projects and have sought to improve their competitiveness through joint ventures.

11.5.5.5 SOURCES OF TECHNOLOGY AND KNOW-HOW

Table 11.41 shows a country comparison of sources of technology and know-how. Korean firms regard the United States as the most important source of technology and know-how, followed by Japan (with a mean score of 4.682 and 4.619, respectively). In contrast, non-Korean firms regard West Germany as the most important source, followed by the US (with a mean score of 3.833 and 3.800, respectively).

In the case of Korean firms, this phenomenon, in which the US and Japan have been the leading suppliers of technology for the Korean plant and construction industry, may be attributable to geographical proximity and past political and cultural ties in the case of Japan and to past political and economic ties and the high level of technology in the case of the US.

Non-Korean firms consider West Germany, the US and the UK to be the three most important sources of technology and know-how, each with a similar mean score. This can be attributed to psychic distances (similarities in culture, business and customs) as well as their high level of technology.

An industry comparison is portrayed in Table 11.42. Plant exporters regard Japan as the most important source of technology and know-how, followed by the US (with a mean score of 4.786 and 4.538, respectively), while construction firms favour the US, followed by the UK (with a mean score of 4.316 and 3.867, respectively).

TABLE 11.41

A COUNTRY COMPARISON BETWEEN KOREA AND OTHER COUNTRIES WITH REGARD TO SOURCES OF TECHNOLOGY AND KNOWHOW

Variable Number	Sources of Technology and Knowhow	Weighted Mean Score	
		Korea(a)	Others(b)
* V391	The United States of America	4.682(1) @4.833	3.800(2) @3.000(3)
V392	The United Kingdom	3.133(4) @3.000	3.778(3) @3.600(1)
* V393	West Germany	3.412(3) @3.444	3.833(1) @3.400(2)
* V394	France	2.833(5) @2.889	3.000(5) @3.000(3)
* V395	Japan	4.619(2) @4.167	3.125(4) @2.400(5)

Source: Calculated from the output of SPSS (Crosstabulation Analysis) for question No. 66. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: 6 (the only method); 5 (the main but not sole); 4 (the second in importance); 3 (the third in importance) ; 2 (the fourth in importance); and 1 (the fifth in importance).

Note: 1. (a) The sample of Korean firms consists of 22 in V391, 15 in V392, 17 in V393, 12 in V394 and 21 in V395.
(b) The sample of non-Korean firms consists of 10 in V391, 9 in V392, 6 in V393, 5 in V394 and 8 in V395.
2. Figures in brackets indicate ranking according to relative importance of the sources of technology and knowhow.

Note: 1. @ represents the output of SPSS (Discriminant Analysis).
2. * represents significantly discriminated variable based on discriminant analysis. Eigenvalue, canonical correlation, Wilks lambda and significance are 2.956, 0.864, 0.253 and 0.000, respectively. Percent of grouped cases correctly classified: 95.83%.
3. The sample firms in discriminant analysis are (a) 18 and (b) 5, respectively.

The US has been the biggest exporter in the world plant and construction market since 1982 (see Chapter 6). Accordingly, it is natural that construction firms believe the US to be the most important source of their technology and know-how.

TABLE 11.42

AN INDUSTRY COMPARISON BETWEEN PLANT EXPORTERS AND CONSTRUCTION FIRMS WITH REGARD TO SOURCES OF TECHNOLOGY AND KNOW-HOW

Variable Number	Sources of Technology and Knowhow	Weighted Mean Score	
		Plant (a)	Constru- tion (b)
* V391	The United States of America	4.538(2) @4.769(1)	4.316(1) @4.000(1)
V392	The United Kingdom	3.222(4) @2.923(5)	3.867(2) @3.400(2)
V393	West Germany	3.615(3) @3.538(3)	3.400(4) @3.300(3)
* V394	France	2.889(5) @3.231(4)	2.875(5) @2.500(5)
* V395	Japan	4.786(1) @4.385(2)	3.667(3) @3.000(4)

Source: Table 11.41.

Note: 1. (a) The sample of plant exporters consists of 13 in V391 and V393, 9 in V392 and V394 and 14 in V395.
(b) The sample of construction firms consists of 19 in V391, 15 in V392 and V395, 10 in V393 and 8 in V394
2. Figures in brackets indicate ranking according to relative importance of the sources of technology and know-how.

Note: 1. @ represents the output of SPSS (Discriminant Analysis).
2. * represents significantly discriminated variable based on discriminant analysis. Eigenvalue, canonical correlation, Wilks lambda and significance are 0.511, 0.581, 0.662 and 0.045, respectively. Percent of grouped cases correctly classified: 79.2%.
3. The sample firms in discriminant analysis are (a) 13 and (b) 10, respectively.

In the case of plant exporters, Japan is considered to be the most important source of technology. This may be partly explained by a sharp increase in in-house R & D expenditures in parallel with an increase in the technological independence of the Japanese economy (see Graph 11.6 and Table 11.23). Japan has succeeded in narrowing the technological gap with the US, and has overtaken the US and European countries in the field of applied technology, development and commercialisation. As a consequence, she is now a leading supplier of technology and know-how in the world plant industry.

11.6 COMPETITIVE ADVANTAGE

This section will present attitudinal differences between Korean and non-Korean firms and between plant exporters and construction firms with regard to: (a) the eclectic theory of international production (in particular, ownership and location-specific advantages) advanced by Dunning and (b) the impediments (i.e. general, economic and governmental) to obtaining competitive advantage.

11.6.1 THE ECLECTIC THEORY OF INTERNATIONAL PRODUCTION

When operating outside their national boundaries firms initially operate in an alien environment with different laws and customs from those in the home country, implying that the multinational enterprise (MNE) is at a disadvantage with regard to indigenous firms when entering a foreign market. Accordingly, the MNE must possess some offsetting advantages in order to be able to compete with indigenous firms.

The eclectic theory advanced by Dunning (1981) suggests that a firm will engage in foreign direct investment if three conditions are satisfied: 1) The firm possesses ownership advantages over firms indigenous to the host country and also over firms of other nationalities; 2) Assuming condition 1) is satisfied, the ownership advantages must be more beneficially exploited internally by the enterprise rather than externalised by means of selling or licensing those advantages to other firms; 3) Assuming condition 1) and 2) are satisfied, it is more profitable for the firm to undertake production outside national borders using internalised ownership advantages than it is to serve foreign markets by exporting.

Ownership-Specific Advantages

Enterprises of one nationality must obtain or possess assets not available to indigenous firms or other nationality to overcome sufficiently the disadvantages which they will face in operating in a new and foreign environment (Dunning and McQueen, 1981).

It should be noted that only the MNE has access to all three types of ownership advantages, that is, firm-specific, industry-specific and country-specific factors. Firm-specific factors are those factors which the firm generates in order to differentiate its product from those of all other firms in the industry. In contrast, country-specific factors are characteristics of the home or host country (i.e. size of domestic market, local resources, availability of capital and labour and government policy, etc.) that the firm may exploit to differentiate itself from firms of other nationalities.

TABLE 11.43

A COUNTRY COMPARISON BETWEEN KOREA AND NINE OTHERS WITH REGARD TO OWNERSHIP ADVANTAGES

Variable Number	Factor	Weighted Mean Scores	
		Korea (a)	9 Others (b)
* V401	Product or process diversification	4.080(4)	5.222(2)
* V402	Ability to take advantage of division of labour and specification	4.360(3)	3.889(7)
* V403	Proprietary technology	3.000(10)	5.444(1)
V404	Trade marks	3.560(7)	3.111(9)
V405	Production management	4.680(1)	4.444(4)
* V406	Organisational, marketing systems	4.520(2)	5.111(3)
V407	Exclusive or favoured access to inputs (e.g. labour, national resources and finance)	3.520(8)	4.222(5)
V408	Ability to obtain inputs on favoured terms (due e.g. to size or monopolistic influence)	3.600(6)	4.111(6)
* V409	Exclusive or favoured access to product markets	3.200(9)	3.778(8)
* V410	Government protection (e.g. control on market entry)	3.680(5)	2.556(10)

Source: The output of SPSS (Discriminant Analysis) for question No. 67. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: from 7 (extremely important) to 1 (extremely unimportant).

Note: 1. * represents significantly discriminated variable. Eigenvalue, canonical correlation, Wilks lambda and significance are 1.890, 0.809, 0.346 and 0.0000, respectively. Percent of grouped cases correctly classified: 94.12%.
2. (a) 25 companies (b) 9 companies, 9 countries.
3. Figures in brackets indicate ranking according to relative importance.

Table 11.43 shows a country comparison between Korea and 'other' countries of the ownership-specific advantages which they possess. Six variables significantly discriminate between the two country groups. The most significantly discriminated variable is V403 (proprietary technology), followed by V410 (government protection) and V401 (product or process diversification). Korean firms regard V405 (production management) and V406 (organisational, marketing system) as their two most important ownership advantages (with a mean score > 4.500), and V403 as the least important (with a mean score of 3.000). In contrast, non-Korean firms consider proprietary technology and product or process diversification to be the two most important ownership advantages which they have (with a mean score > 5.200), and government protection to be the least important (with a mean score of 2.556). The most noticable feature in these comparisons is the weakness of Korean firms with respect to their lack of proprietary technology.

The selected discriminant variables have a quite strong discriminant power on the evidence of the canonical correlation coefficient (0.809). At 0.0000 significance level, 32 (94.12%) of 34 observations are correctly classified.

An industry comparison between plant exporters and construction firms is not discussed because of the weak discriminant power and significance level.

Location-Specific Advantages

Country-specific factors of host country are generally dealt with under 'location advantages'. The essence of the argument is that the decision on where to produce is determined by the differences in location attractions or advantages offered by alternative production sites. Natural resources, politics, legislation, environmental, social and many other factors (which are important to firm's cost minimisation or profit maximisation policies) all vary from country to country. Consequently, firms will choose to locate in those countries that offer the most suitable mix of locational advantages.

Table 11.44 shows a country comparison between Korea and eight other countries with regard to location-specific advantages attributed to Korean firms. Four variables significantly discriminate between the two country groups, the most significant of which is V414 (government intervention), followed by V417 (psychic distance). Both Korean and non-Korean firms regard V412 (input prices, quality and productivity differentials) as the most important location-specific advantage attributed to Korean firms (with a mean score > 5.200) and V417 as one of the least important (with a mean score of 3.708 and 3.545, respectively). These findings indicate that input prices, quality and productivity differentials rather than psychic distance are generally the most important location-specific advantage attributed to Korean firms.

Korean firms regard government intervention as the least important location-specific advantage attributed to Korean firms (with a mean score of 3.458), but non-Korean firms in contrast regard this to be the second most important Korean advantage (with a mean score of 5.182).

A large eigenvalue (0.830) and canonical correlation (0.673) indicate a fairly strong power of the function to discriminate. At 0.0009 significance level, 30 (83.3 %) of 36 observations are correctly classified.

TABLE 11.44

A COUNTRY COMPARISON BETWEEN KOREA AND EIGHT OTHER COUNTRIES WITH REGARD TO LOCATION-SPECIFIC ADVANTAGES ATTRIBUTED TO KOREAN FIRMS

Variable Number	Factor	Weighted Mean Score	
		Korea (a)	8 Others (b)
* V411	Spatial distribution of inputs and markets	4.208(4)	3.818(6)
V412	Input prices, quality and productivity differentials	5.208(1)	5.455(1)
* V413	Transport and communication costs	4.292(3)	5.000(3)
* V414	Government intervention	3.458(8)	5.182(2)
V415	Control on imports, tax rates, incentives, climate for investment, political stability	4.042(5)	4.727(4)
V416	Infrastructure (commercial, legal, transportation)	4.375(2)	4.636(5)
* V417	Psychic distance (language, cultural, business, customs etc. differences)	3.708(7)	3.545(8)
V418	Economies of R&D, production and marketing	4.000(6)	3.727(7)

Source: The output of SPSS (Discriminant Analysis) for question No. 68.
Calculation of the above figures: see Table 11.43.

Note: 1. * represents significantly discriminated variable.
Eigenvalue, canonical correlation, Wilks lambda and significance are 0.830, 0.673, 0.546 and 0.0009, respectively.
Percent of grouped cases correctly classified: 83.33%.
2. (a) 24 companies (b) 11 companies, 8 countries.
3. Figures in brackets indicate ranking according to relative importance.

In Table 11.45, in the case of an industry comparison between plant exporters and construction firms' perceptions of location advantages, only three variables significantly discriminate. V412 is the most significantly discriminated variable and both industry groups consider V412 and V413 (transport and communication costs) to be the two most important location-specific advantages, but plant exporters regard them as the more important.

TABLE 11.45

AN INDUSTRY COMPARISON BETWEEN PLANT EXPORTERS AND CONSTRUCTION FIRMS REGARDING LOCATION-SPECIFIC ADVANTAGES ATTRIBUTED TO KOREAN FIRMS

Variable Number	Factor	Weighted Mean Score	
		Plant (a)	Construction (b)
V411	Spatial distribution of inputs and markets	4.294(5)	3.875(6)
* V412	Input prices, quality and productivity differentials	5.529(1)	4.813(1)
V413	Transport and communication costs	4.647(2)	4.438(2)
V414	Government intervention	4.059(6)	3.875(6)
V415	Control on imports, tax rates, incentives, climate for investment, political stability	4.529(3)	4.000(4)
V416	Infrastructure (commercial, legal, transportation)	4.471(4)	4.438(2)
* V417	Psychic distance (language, cultural, business, customs etc. differences)	4.059(6)	3.375(8)
* V418	Economies of R&D, production and marketing	3.824(8)	4.000(4)

Source: Table 11.44. Calculation of the above figures: see Table 11.43.

Note: 1. * represents significantly discriminated variable.
Eigenvalue, canonical correlation, Wilks lambda and significance are 0.270, 0.461, 0.787 and 0.070, respectively.
Percent of grouped cases correctly classified: 64.7%.
2. (a) 17 companies (b) 16 companies.
3. Figures in brackets indicate ranking according to relative importance.

Plant exporters and construction firms, respectively, consider V418 (economies of R & D, production and marketing) and V417 (psychic distance) to be the least important location-specific advantages attributed to Korean firms. Plant exporters consider all variables except V418 to be more important than do construction firms.

A small eigenvalue (0.270) and canonical correlation (0.461) indicate a weak power of the function to discriminate. At 0.07 significance level, 22 (64.7%) of 34 observations are correctly classified.

11.6.2 IMPEDIMENTS TO OBTAINING A COMPETITIVE ADVANTAGE

There are a variety of impediments to achieving ownership and location-specific advantages, and they can block the plant and construction industry from becoming a global industry altogether. Even when the advantages of global competition outweigh the impediments overall, the impediments can still produce viable strategic niches for national firms which do not compete globally.

This sub-section will present the attitudinal differences (between the two country groups and between the two industry groups) with regard to: (a) general impediments to an improvement in international competitive power; (b) economic impediments to obtaining a competitive advantage; and (c) governmental impediments to global competition.

General Impediments to An Improvement in International Competitive Power

Table 11.46 shows a country comparison between Korea and eight other countries regarding general impediments to improving international competitive power. Four variables significantly discriminate between the two country groups, indicating that V330 (lack of high technological manpower) is the most significantly discriminated variable, followed by V331 (lack of design ability).

TABLE 11.46

A COUNTRY COMPARISON BETWEEN KOREA AND EIGHT OTHER COUNTRIES REGARDING GENERAL IMPEDIMENTS TO IMPROVING INTERNATIONAL COMPETITIVE POWER

Variable Number	Factor	Weighted Mean Score	
		Korea (a)	8 Others (b)
V324	Low technology	4.923(6)	3.385(3)
V325	Insensitivity of spot market information	5.051(4)	3.000(5)
V326	Small scale of capital	4.103(9)	2.692(9)
V327	Lack of experience	5.077(3)	2.923(8)
* V328	Lack of ability to win orders	4.974(5)	3.308(4)
* V329	Inadequacy of government support system	4.513(8)	4.385(1)
* V330	Lack of high technological manpower	5.667(2)	3.000(5)
* V331	Lack of design ability	6.026(1)	3.462(2)
V332	Low standardisation and low quality of home-made machinery and supplies	4.872(7)	3.000(5)

Source: The output of SPSS (Discriminant Analysis) for question No. 53. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: from 7 (highly influential) to 1 (highly uninfluential).

Note: 1. * represents significantly discriminated variable. Eigenvalue, canonical correlation, Wilks lambda and significance are 1.038, 0.714, 0.491 and 0.0000, respectively. Percent of grouped cases correctly classified: 92.3%.
2. (a) 39 companies (b) 13 companies, 8 countries.
3. Figures in brackets indicate ranking according to relative effect on the international competitive power.

Overall, in Table 11.46, Korean firms have been more significantly influenced by general impediments to improving their international competitive power compared with non-Korean firms. In particular, the most influential impediment originates in the technological field, such as lack of design ability and high technological manpower (with a mean score > 5.667), the response to which lies in higher levels of investment, manpower training, the introduction of more advanced technology and joint-ventures and consortia arrangements with firms from developed countries. Government promotion of new technology can be one means of solving the disparity in technological expertise between Korea and developed countries in the short-term. However, the type of "tie-in clauses" that advanced countries insert into contracts with Korea impede technology transfer.

In accordance with the requirements of the latest trend for large projects requiring complex technology, a satisfactory response to the problem of the advancement of technological standards has become a focal point for greater international competitive power. In contrast, non-Korean firms regard the inadequacy of the government support system rather than the technological field as the most influential factor.

In the case of Korean firms, the lack of experience becomes an important impediment when connected with the lack of ability to win orders and an insensitivity to spot market information (with a mean score > 4.974). These factors directly impede a more successful contract ratio against tenders and adversely affects the total amount of orders received. The ability to win orders can be increased by training specialist salesmen, but success is also influenced by non-economic variables such as political and social factors.

Both country groups consider the possibility that the small scale of capital (V326) has not had an important effect on international competitive power. However, research has suggested that capital formation contributed to 22% of GNP growth in the US between 1948 and 1969 (Denison, 1967), and 40%, during the post-war period (Jorgenson, 1979)*.

The selected four discriminant variables have a quite strong discriminant power and there is a significant difference at 0.0000 significance level. 48 (92.3%) of 52 observations were correctly classified, indicating this classification to be highly effective.

Table 11.47 shows an industry comparison between plant exporters and construction firms regarding general impediments.

TABLE 11.47

AN INDUSTRY COMPARISON BETWEEN PLANT AND CONSTRUCTION FIRMS REGARDING GENERAL IMPEDIMENTS TO IMPROVING INTERNATIONAL COMPETITIVE POWER

Variable Number	Factor	Weighted Mean Score	
		Plant (a)	Construction (b)
V324	Low technology	4.760(6)	4.560(4)
* V325	Insensitivity of spot market information	5.040(4)	4.240(7)
* V326	Small scale of capital	3.760(9)	3.880(9)
* V327	Lack of experience	5.200(3)	4.080(8)
V328	Lack of ability to win orders	5.000(5)	4.320(6)
* V329	Inadequacy of government support system	4.520(8)	4.600(3)
* V330	Lack of high technological manpower	5.480(2)	4.760(2)
* V331	Lack of design ability	5.560(1)	5.480(1)
V332	Low standardisation and low quality of home-made machinery and supplies	4.600(7)	4.440(5)

Source: Table 11.46.
Calculation of the above figures: see Table 11.46.

Note: 1. * represents significantly discriminated variable.
Eigenvalue, canonical correlation, Wilks lambda and significance are 0.375, 0.522, 0.727 and 0.0262, respectively.
Percent of grouped cases correctly classified: 68.6%.
2. (a) 25 companies (b) 25 companies.
3. Figures in brackets indicate ranking according to relative effect on the international competitive power.

Six variables significantly discriminate between the two industry groups, with lack of experience being the most significantly discriminated variable.

Both industry groups regard the lack of design ability and the lack of high technological manpower as the two most influential impediments, and small scale of capital as the least influential.

A small eigenvalue (0.375) and canonical correlation (0.522) indicate a weak discriminant power. At 0.0262 significance level, 35 (68.6 %) of 51 observations are correctly classified.

Economic Impediments to Obtaining A Competitive Advantage

Table 11.48 shows a country comparison between Korea and seven other countries regarding economic impediments (based on Porter's concepts) to obtaining a competitive advantage.

Porter (1980) has suggested a number of economic impediments to obtaining a competitive advantage as follows:

1. Transportation and storage costs. Transport or storage costs offset economies of centralised production as well as the efficiency of centralised production in an integrated system.
2. Differing product needs. Global competition is impeded when national markets demand different product varieties.
3. Established distribution channels. The need to gain access to distribution channels in each national market can impede global competition.
4. Local manufacturer's direct sales force. If the product requires a local manufacturer's direct sales force, the international competitor

confronts a potential scale economy barrier, most severe if national competitors' sales forces sell a wide line of products.

5. Sensitivity to lead times. Sensitivity to lead times owing to short fashion cycles, rapidly moving technology and so on, tends to work against global competition.
6. Complex segmentation within geographic markets. Complex price-performance trade-offs among competing brands by customers in national markets have the same basic effect as national product variety differences in impeding global competition.
7. Lack of world demand. Global competition cannot occur if demand does not exist in a significant number of major countries.

In Table 11.48, two variables significantly discriminate between the two country groups, indicating V419 (transportation and storage costs) to be more significantly discriminated. Korean firms regard V422 (local manufacturers' direct sales force) and V425 (lack of world demand) as the two most significant economic impediments to obtaining their competitive advantage (with a mean score > 4.708). In contrast, non-Korean firms consider V425 to be the most significant one (with a mean score of 5.273). These findings suggest that plant exporters and construction firms in both country groups have suffered most from the lack of world demand in the plant and construction markets.

Both country groups claim that the established distribution channels (showing the lowest mean score) do not play an important role as an economic impediment. Overall, the table shows that non-Korean firms have been more significantly influenced by all economic impediments except V422 compared with Korean firms.

The selected two discriminant variables have a weak discriminant power and at 0.0466 significant level, 24 (66.7%) of 36 observations are correctly classified.

An industry comparison between plant exporters and construction firms is not discussed because of a weak discriminant power and low significance level (0.1918).

TABLE 11.48

A COUNTRY COMPARISON BETWEEN KOREA AND 7 OTHER COUNTRIES REGARDING THE ECONOMIC IMPEDIMENTS TO OBTAINING A COMPETITIVE ADVANTAGE

Variable Number	Factor	Weighted Mean Score	
		Korea (a)	7 Others (b)
* V419	Transportation and storage costs	3.875(5)	4.636(3)
V420	Differing product needs	3.792(6)	4.273(4)
V421	Established distribution channels	3.750(7)	3.909(7)
V422	Local manufacturer's direct sales force	4.792(1)	4.182(5)
V423	Sensitivity to lead times (because of short fashion cycles, rapidly moving technology)	4.000(3)	4.091(6)
V424	Complex segmentation within geographic markets	3.958(4)	4.545(2)
* V425	Lack of world demand	4.708(2)	5.273(1)

Source: The output of SPSS (Discriminant Analysis) for question No. 69. Calculation of the above figures was based on multiplying the frequency count of each value by weights given to these values: from 7 (extremely significant) to 1 (extremely insignificant).

Note: 1. * represents significantly discriminated variable. Eigenvalue, canonical correlation, Wilks lambda and significance are 0.211, 0.418, 0.826 and 0.0466, respectively. Percent of grouped cases correctly classified: 66.7%.

2. (a) 25 companies (b) 11 companies, 7 countries.

3. Figures in brackets indicate ranking according to relative significance of economic impediments.

Governmental Impediments to Global Competition

There are a number of government impediments to global competition, which usually exist to protect local firms or local employment. Government impediments can either be in a form that helps locally owned firms or requires foreign firms to produce in the country (which nullifies possible scale economies from global production). Government regulations may also require international competitors to sell product varieties peculiar to the host country, which affects marketing practices by making them more country-specific. Government impediments will be most likely to take place in industries that affect some important government objectives such as employment, regional development, indigeneous sources of strategic raw materials and defence.

Table 11.49 shows a country comparison between Korea and nine other countries regarding the significance of governmental impediments to global competition. Only weighted mean scores can be compared with because no variable is qualified for the discriminant analysis.

Both Korean and non-Korean firms appear to consider V430 (preferential tax treatment, labour policies, or other operating rules and regulations benefiting local firms) to be the most significant governmental impediment to their global competition (with a mean score > 5.480).

It can be seen from the table that Korean firms regard V428 (preferential procurement from local firms by government entities) as the second most significant impediment (with a mean score of 5.323). In contrast, non-Korean firms consider V426 (tariffs and duties) to be the second most significant one (with a mean score of 5.071). The relatively lower significance of tariffs and duties to Korean firms may be attributable to the generalised system of preference (GSP), which is a duty free or low tariff system developed countries have granted to developing countries since the early 1970s.

Although Korean firms have enjoyed duty free or low tariff access to developed country markets, the United States and the European Economic Community (EEC) are currently using the GSP in a "carrot and stick" attempt to gain more trade concessions from Korea (Korea Newsreview, January 2, 1988). The U.S. government has threatened to withdraw GSP privileges from Korean goods which, on average, would add 5.0% in additional tariffs (Korea Newsreview, October 31, 1987).

TABLE 11.49

A COUNTRY COMPARISON BETWEEN KOREA AND NINE OTHER COUNTRIES REGARDING THE SIGNIFICANCE OF GOVERNMENTAL IMPEDIMENTS TO GLOBAL COMPETITION

Variable Number	Factor	Weighted Mean Score	
		Korea (a)	9 Others (b)
V426	Tariffs and duties	4.774(4)	5.071(2)
V427	Quotas	4.129(6)	4.429(6)
V428	Preferential procurement from local firms by government and quasi-government entities	5.323(2)	4.929(3)
V429	Govenmental insistence on local R & D or requiring locally produced components in the products	4.677(5)	4.571(5)
V430	Preferential tax treatment, labour policies, or other operating rules and regulations benefiting local firms	5.484(1)	5.786(1)
V431	Anti-bribery laws, tax laws, or other policies by home governments	4.903(3)	4.786(4)

Source: The output of SPSS (Discriminant Analysis) for question No. 70.
Calculation of the above figures: see Table 11.48.

Note: 1. No variable qualified for the discriminant analysis.
2. (a) 31 companies, (b) 14 companies, 9 countries.
3. Figures in brackets indicate ranking according to relative significance of governmental impediments.

Both country groups appear to regard V427 (quotas) and V429 (governmental insistence on local R&D or high local procurement ratios in the products) as the two least significant governmental impediments (with a mean score < 4.678).

Table 11.50 shows an industry comparison between plant exporters and construction firms.

TABLE 11.50

AN INDUSTRY COMPARISON BETWEEN PLANT AND CONSTRUCTION FIRMS REGARDING THE SIGNIFICANCE OF GOVERNMENTAL IMPEDIMENTS TO GLOBAL COMPETITION

Variable Number	Factor	Weighted Mean Score	
		Plant (a)	Construction (b)
V426	Tariffs and duties	4.867(3)	5.063(4)
V427	Quotas	4.267(5)	4.625(6)
V428	Preferential procurement from local firms by government and quasi-government entities	5.200(1)	5.313(2)
V429	Govenmental insistence on local R & D or requiring locally produced components in the products	4.200(6)	4.750(5)
* V430	Preferential tax treatment, labour policies, or other operating rules and regulations benefiting local firms	5.067(2)	5.875(1)
V431	Anti-bribery laws, tax laws, or other policies by home governments	4.533(4)	5.250(3)

Source: Table 11.49.
Calculation of the above figures: see Table 11.48.

Note: 1. * represents significantly discriminated variable. Eigenvalue, canonical correlation, Wilks lambda and significance are 0.131, 0.340, 0.884 and 0.06, respectively. Percent of grouped cases correctly classified: 70.6%.
2. (a) 15 companies, (b) 16 companies.
3. Figures in brackets indicate ranking according to relative significance of governmental impediments.

V430 among six variables significantly discriminates between the two industry groups. Plant exporters appear to regard V428 as the most significant governmental impediment (with a mean score of 5.200). In contrast, construction firms consider V430 to be the most significant one (with a mean score of 5.875). On the whole, both industry groups appear to suffer most significantly from these two factors, namely, preferential tax treatment, labour policies, or other operating rules and regulations benefiting local firms (V430) and the preferential procurement from local firms by government entities (V428).

It is worthy of mention that the international construction firms regard V431 (anti-bribery laws, tax laws, or other policies by home governments) as a fairly significant governmental impediment (with a mean score of 5.250), suggesting that legal impediments may play an important role in the success and structure of the world construction markets. Construction firms have had more experience of governmental impediments in global markets than have plant exporters.

The one selected discriminant variable (V430) has a fairly weak discriminant power on the evidence of the canonical correlation coefficient (0.340). At 0.06 significance level, 24 (70.6%) of 34 observations are correctly classified.

11.7 SUMMARY AND CONCLUSIONS

This chapter set out to investigate, interpret and compare international competition in the plant and construction industry between Korean and non-Korean firms on the one hand and plant and construction exporting firms on the other. The investigation covered: (1) estimates of the competitive power of Korean plant and construction exports; (2) a comparison of the international competitive power of plant exports by "revealed" comparative advantage; and (3) attitudes of plant exporters and construction firms towards the education system, technology transfer and competitive advantage.

Estimates of the Competitive Power of Korean Plant and Construction Exports

In comparison with developed countries with regard to Korean international competitive power as estimated by Korean firms, Korean plant and construction firms appear to compete successfully against advanced industrial countries with respect to price and delivery but experience technological weakness. Thus, we can argue that continuous efforts to upgrade technology holds the key to the future growth of the Korean industries, given that price advantages are likely to erode over time in favour of NICs and price differentials between Korea and advanced countries will continue to shrink. In particular, the research has shown that an inability to compete on price is the greatest disadvantage in competition with Taiwan.

The views held by non-Korean firms from developed countries were that the success of Korean firms has depended upon price and competent financial arrangements, and failure upon technology and inadequate finance, offering further evidence of the technological implications for Korean industry. Note that these firms consider payment conditions to be an important factor in both successes (i.e. price) and failures (i.e. inadequate finance) experienced by the Korean plant and construction export industries.

In comparison with Korean international competitive power as estimated by Korean firms, non-Korean firms from developed countries appeared to emphasise the importance of payment conditions and de-emphasise date of delivery, suggesting that further research into these factors is essential.

A recent survey executed by the Korea Foreign Trade Association has shown that between 1986 and 1987 Korean exports were losing competitive power in all the major factors (i.e. price, quality and after-sales service) except for design and packaging when compared with rival countries such as China, Taiwan and Hong Kong. Reasons for this include the higher cost of Korean goods because of the recent steep appreciation of the Korean currency and labour disputes, both of which are predictable penalties associated with successful export-led growth strategies. The only appropriate response is for the introduction of measures to increase productivity and the quality of technological inputs.

A Comparison of the International Competitive Power of Plant Exports by "Revealed" Comparative Advantage

Measured by "revealed" comparative advantage, the United States appeared to have relative advantages in plant exports with respect to overall general plant (154.7), followed by the U.K. (124.6) and Italy (120.0) in 1985.

The research has shown that when comparing the relative position of countries by commodity group, in transport equipment the United States leads in the case of aircrafts, but France in railway vehicles; in the non-electrical power machinery group, the US leads in steam engines and turbines (with similar level to West Germany) and internal combustion piston engines, but the UK and Japan in engines and motors n.e.s. and steam boilers, respectively; in agricultural, textile and leather machinery, Italy possesses relative advantages; in metalworking machinery, Italy leads but with a similar level to Japan and West Germany. Turning to machines for special industries, the US possesses relative advantages in producing civil engineering equipments, West Germany in paper milling, printing and book binding machinery, and Italy in non-domestic food machinery and other machinery for special industries. On the whole, Italy and West Germany are at an advantage in the non-electrical machine group. In the case of electrical power machinery and switchgear products, Singapore leads in rotating electrical plant and switchgear products, but Hong Kong and France lead in electrical power machinery n.e.s. and electricity distributing machine, respectively. In telecommunication equipment products, Japan is at an advantage. Finally, Korea leads in the exportation of structures and parts of iron and steel. This pattern of dispersed comparative advantage demonstrates the tendency towards intra-industry trade and specialisation.

Specialisation within commodity categories is also observable in regard to precision machinery in the developed countries and light electrical and telecommunication equipments in the NICs, indicating a) that trade patterns are determined largely by inter-country differences in relative costs b) that differences in the level of technology are often considerably important, and c) that labour costs greatly affect the determination of comparative advantage in the case of light electrical and telecommunication equipments. It was also found that the traditional gains derived from substituting cheaper imports for more expensive domestic merchandise are relevant in regard to simple and labour-intensive manufactures such as textile and leather machinery, electrical power machinery n.e.s. and structures and parts of iron and steel.

Between 1981 and 1985, the developed countries, except Italy, show generally only slight changes in RCA by plant product items, indicating a mature phase of plant exports. In contrast, Italy and NICs show a relatively rising trend.

In further research, it would appear desirable to examine the stability of the RCA indices, and the relationship between the level of technological development and comparative advantage in plant exports.

Attitudes of Plant Exporters and Construction Firms towards the Education System

The fact that non-Korean firms appear to have been supplied more adequately with qualified manpower by their education system than have Korean firms explains much of the weakness of Korean firms in technological factors such as design ability and quality. In Korea, there has been an absence of clear long-run educational and employment policies.

Korean plant exporters and construction firms have suggested that, to increase its capability to supply adequate manpower, schools should be provided with more modern techniques and facilities and commit more resources to technical education. For example, one-third of Korean firms believe that the Korean technical education system badly or poorly satisfies their requirements for adequate technical manpower because of the absence of a long-run national strategy for technical and vocational education. One consequence of this is that, in general, non-Korean firms are far more satisfied with the standard of recently graduated appointees employed by their firms compared with those of Korean firms. In particular, non-Korean firms are quite satisfied with their level of technical competence and academic knowledge relative to their recently appointed technicians.

Capital intensive firms in Korea tend to be more satisfied with the technical competence, academic knowledge, technical originality and ability to deal with problems of recently appointed technicians than labour-intensive firms. This may be because capital-intensive technologies are generally associated with more complex production techniques and higher levels of technical skills. However, capital-intensive firms tend to give lower assessment to those appointees regarding social integration, perhaps because of rigid work regulations and automation process associated with capital-intensive operations. In the case of work discipline, there is no significant difference between labour and capital-intensive firms in their evaluation of their recent appointees.

Technology Transfer

With regard to the ratio of R & D expenditure to GNP, Korea falls behind the developed countries, suggesting that it must not only continue to restructure its industry but also move up the technological ladder in order to remain competitive in world trade.

The annual trend of technology inflows in Korea, which shows a rapid increase, has kept pace with industrial development and in response to liberalisation. In particular, the sharp rise of royalty payments in 1986 and 1987 is indicative of efforts by Korean firms to introduce costly advanced technology in a bid to boost the competitive edge of their products. However, Korea has been heavily dependent on the US and Japan, and has neglected European suppliers. Thus, the total number of introductions from, and the total amount of the royalty payments to, the US and Japan equated to 78.0% and 74.5%, respectively. The number of technology introductions from the US is smaller than from Japan, while the amount of royalties paid to the US is larger than to Japan, indicating that the technology introduced from the US is clearly of a higher level.

An industry comparison showed that in Korea four industries (i.e. mechanical, electrical and electronics, petrochemical and metallic industries) have absorbed more than 70.0% of the technology cases introduced to Korea and have made 64.0% of royalty payments in the period 1962-85. In contrast, the construction industry has absorbed only about 2.0% of both technology cases introduced and royalty payments over the same period.

Technology exports from Korea have decreased in both number of cases exported and amount of royalty receipts since 1983 because of a more active Korean government policy for introducing technology from developed countries. Consequently, the negative technology balance of payments in technology trade has worsened year after year, showing the increasing dependence of the Korean economy on foreign technology to sustain its development.

Technology transfer to Korea has a number of problems, as follows: a) over dependence on the US and Japan; b) the import of unpackaged technology through the licensing of patents has seldom occurred; c) most imported technologies consist largely of the introduction of basic know-how; d) even simple techniques are imported so as to enhance pubic acceptance of the final products; e) foreign technology has been accepted in order to secure foreign capital; f) the majority of Korean firms have failed to develop their own research and development because of preferential loans for technology purchases; g) there are few supporting systems for the diffusion of domestically developed technology; h) there is little incentive to these who adapt and improve introduced technologies; and i) the linkage between domestic development of technology and introduced technology is very weak.

It was found that non-Korean firms have used a fairly sophisticated technology and Korean firms a conventional or fairly unsophisticated one, pointing to a relative weak competitive power of Korean firms in technological factors. This may be attributable to more active and strenuous efforts to upgrade the quality of products through the introduction of technology and in-house R & D investments in non-Korean firms compared with Korean firms.

On the whole, both Korean and non-Korean firms believe the technological level of Korean plant exporters in all the production phases to be inferior to that of developed countries (except, in the view of non-Korean firms, for machinery production).

The research has shown that non-Korean firms have experienced more competitive pressures in plant and construction markets than have Korean firms. This may be attributable to a more active export strategy by non-Korean firms to increase their sales and market share growth rates compared with Korean firms. The research has also shown that construction firms have experienced a slightly more competitive pressures than have plant exporters. This may be due to a depressed oil market, in consequence of which clients have frequently posponed or cancelled potentially unprofitable projects, resulting in few orders in construction market.

Korean firms regard the direct purchase of technology patents as the most important method of technology transfer, followed by licence agreements. In contrast, non-Korean firms regard joint-ventures as the most important method and direct purchase of technology patents as the least important. This may be due to a sharp increase in the demand for core technology which Korea experiences as Korean industries become more sophisticated and their technological levels improve. Non-Korean firms may regard joint-ventures as the most important because this mode allows them to cope with tariff and non-tariff barriers from LDCs.

It was found that both Korean and non-Korean plant exporters consider direct purchase of technology patents to be the most important method of technology transfer, followed by licence agreements, while construction firms favour joint-ventures, followed by the transfer of components in a package. This may be because the plant industry is more heavily dependent than the construction industry on process management and skilled technicians to produce machinery, tools and software parts and to operate and construct work on-the-spot. In contrast, construction firms consider joint-ventures to be the most important method. This may be attributable to the growth in construction by native firms in the Middle-East.

The US and Japan have been shown to be the leading suppliers of technology for the Korean plant and construction industry. This can be explained by geographical proximity and past political and cultural ties in the case of Japan and to past political and economic ties and the high level of technology in the case of US. In contrast, non-Korean firms consider West Germany, the US and the UK to be the three most important sources of technology and know-how. This may be attributed to psychic distances as well as their high level of technology. Plant exporters from Korea and other countries regard Japan as the most important source of technology and know-how, followed by the US, while construction firms favour the US, followed by the UK. The US has been the biggest exporter in the world plant and construction market since 1982, and Japan has become an exporter of technology following her success in narrowing the US technological gap in the world plant industry by a sharp increase in in-house R & D expenditure, which has fostered an increase in the technological independence of the Japanese economy.

Competitive Advantage

Korean firms regard their two most important ownership advantages to be, firstly, production management and, secondly, their organisational marketing system. In contrast, non-Korean firms consider proprietary technology and product or process diversification to be their two most important ownership advantages. The most noticable feature in these comparisons is the absence among Korean firms of proprietary technology as an ownership advantage.

Both Korean and non-Korean firms regard input prices, quality and productivity differentials as the most important location-specific advantage, and psychic distance as one of the least important one attributed to Korean firms. Korean firms regard government intervention as the least important location-specific advantage attributed to Korean firms, but non-Korean firms in contrast regard this as the second most important Korean advantage.

Both plant exporters and construction firms regard input prices, quality, productivity differentials and transport and communication costs as the two most important location-specific advantages attributed to Korean firms, but plant exporters regard them as the more important.

Overall, Korean firms have been more significantly influenced by general impediments to improving their international competitive power compared with non-Korean firms. In particular, the most influential impediment originates in the technological field, such as the lack of design ability and high technological manpower, suggesting that government promotion of new technology can be one means of solving the disparity in technological expertise between Korea and developed countries in the short-term. In contrast, non-Korean firms regard the inadequacy of a government support system rather than the technological field as the most influential factor.

Both industry groups (plant and construction) regard the lack of design ability and high technological manpower as the two most influential impediments, and the small scale of capital as the least influential.

Korean firms regard local manufacturers' direct sales forces and lack of world demand as the two most significant economic impediments to obtaining their competitive advantage. In contrast, non-Korean firms consider lack of world demand to be the most significant one. Thus, it can be inferred from these findings that plant and construction firms in both country groups have most significantly suffered from a lack of world demand attributable to business stagnation from decreased oil prices in the world plant and construction markets.

Both Korean and non-Korean firms consider preferential tax treatment, labour policies, or other operating rules and regulations benefiting local firms to be the most significant governmental impediment to their global competition. Korean firms regard preferential procurement from local firms by government entities as the second most significant impediment, but non-Korean firms consider tariffs and duties to be the second most significant one. The relatively lower significance of tariffs and duties to Korean firms may be attributable to the generalised system of preference (GSP), which is a duty free or low tariff system developed countries have granted to developing countries since the early 1970s.

On the whole, both industry groups appear to suffer most significantly from preferential tax treatment, labour policies, or other operating rules and regulations benefiting local firms and the preferential procurement extended to local firms by government entities.

Finally, it was found that the international construction firms regard anti-bribery laws, tax laws, or other policies by home governments as a fairly significant governmental impediment, suggesting that anti-bribery and tax laws may play an important role in shaping market shares in world construction markets.

NOTES

1. Engineering News Record, July 17, 1986, pp. 51.

2. Korea Newsreview, January 16, 1988, pp. 19.

3. KFTA polled 1,000 foreign buyers in Japan, Hong-Kong, the United States, and West Germany between September and November of 1987 but obtained only 184 replies among 1,000 foreign buyers.

4. Excluding centrally planned economies.

5. S.I.T.C. (5 + 6 + 7 + 8), The numbers 5, 6, 7 and 8 stand for chemicals and related products, manufactured goods classified chiefly by material, machinery and transport equipments, and miscellaneous manufactured articles, respectively.

6. From "The Impact of Industrial Innovation on the Economic and Social Welfare of the United States," Research Management, November 1980, pp. 10-13.

CHAPTER 12

STRATEGIC OPTIONS FOR IMPROVING THE EXPORT PERFORMANCE OF THE KOREAN PLANT AND CONSTRUCTION INDUSTRY

The final chapter of this study discusses some of the strategic options available to improve the export performance of the Korean plant and construction industry. The chapter concludes with policy recommendations and conclusions. The outline is as follows:

1. Introduction.
2. Strategies.
    - 2.1 Strategies for improving the technological level.
    - 2.2 Strategies for enhancing productivity.
    - 2.3 Strategies for adjusting industrial structure.
    - 2.4 Strategies for cultivating small and medium-sized enterprises.
    - 2.5 Strategies for penetration of overseas markets.
    - 2.6 Plans for improving governmental support systems.
3. Policy Recommendations.
4. Conclusions and Indications for Further Research.

12.1 INTRODUCTION

In this research, an attempt has been made to present an objective and comprehensive analysis of the performance of the Korean plant and construction industry. The major concern of this study has been to identify the attitudinal differences a) between country groups (Korea and other countries) and b) between industry groups (plant and construction) with regard to tenders and bidding systems, risk management, contract strategy and international competition. With this intention in mind, the analysis has been more diagnostic than prescriptive. However, certain prescriptions are considered in this chapter in the light of strategic options which we identify.

Although this research has been confined to twelve countries, including Korea, its conclusions and policy recommendations may offer, with a certain level of validity, useful guidelines which may be used to approach and understand the locational variables of other countries. Of special relevance are organisation and managerial practices, particularly those commonly shared by many developing countries.

An understanding of these variables is considered to be helpful in identifying the environmental forces which may affect the operations of plant and construction firms. However, the uniqueness of our case requires adequate precautions to be taken in any attempt to make generalisations which may be superficial and misleading in that each country enjoys distinctive social, economic and political attributes.

12.2 STRATEGIES

This section presents some of the strategic options available to the Korean plant and construction industry in its efforts to improve its export performance, namely: a) improving the technological level; b) enhancing productivity; c) adjusting industrial structure; d) cultivating small and medium-sized enterprises; e) advances into overseas markets; and f) improving governmental support systems.

12.2.1 STRATEGIES FOR IMPROVING THE TECHNOLOGICAL LEVEL

The cultivation of special technological manpower and the introduction of advanced technologies are regarded as essential strategies for improving the technological level of Korean plant and construction firms.

The Cultivation of Specialist Technical Manpower

In the light of the evidence provided and examined in the previous chapters, continuous efforts to upgrade technology holds the key to the future growth of Korean industries. In particular, the cultivation of special technical manpower will play an important role in the growth of Korean plant and construction exports.

Plant and construction exports are accompanied by technologies and know-how embodied in the production processes concerned. Large scale export projects require the expertise of well-experienced project managers to integrate, organise and coordinate the various sub-systems. Without this expertise no amount of finance or long-term credit can contribute much to sustained exports of machinery and equipment.

The special technical manpower needs in this study refer primarily to project managers and engineers, including sales engineers. Project appraisal, project definition, contract strategy and approvals, appointment of professional services, financial strategy, initial budget estimates, commissioning and production/operations are typically the responsibility of the project manager, whereas the engineer is in charge of feasibility studies, design, consultancy and specification. Acute shortages of special technical manpower in these areas continue to contribute to low quality software related to technical services and industrial plant installation and, in effect, to a low technological level in the Korean plant and construction industries. It is very difficult for companies alone to cultivate such specialist technical manpower in the short-term, suggesting that the government should become responsible for technical training and increases in the supply of specialists.

The ability to win orders, which is likely to have a multi-functional dependency (such as sales ability and information collecting ability), is heavily influenced by sales engineers responsible for project selection, negotiation, estimation and contract arrangements etc. Thus, a lack of qualified and competent sales engineers can also be decisive in a firm's ability to capture an order.

Given this lack of specialist technical manpower, the following strategic prescriptions available for a more successful performance by Korean plant and construction firms might be suggested:

(a) The establishment of a training institute for sales engineers engaged in plant and construction exports. The primary goal of the institute would be to enhance the commercial skills of sales engineers in such matters as financial arrangements, insurance, prior inspection, drawing up proposals and methods of tender and contract.

(b) The establishment of a project management institute for project managers engaged in plant and construction exports.[1] This would contribute to better project management through education and training, research and development and consultancy. Particular attention would need to be paid to the management of uncertainties associated with quality targets and cost overruns in complex, large-scale modern projects.

(c) A wage policy and structure review could be implemented to re-structure salary scales in favour of technical school leavers and to affect the pattern of educational and occupational choices in general.

The Introduction of Advanced Technologies

In the case of developing countries like Korea, which are lacking in domestic technology and the capacity to develop a technological independence, the competitiveness of domestic industries is heavily dependent on sustained and early procurement of advanced technologies.

Technology transfer from abroad should be promoted to complement gaps in domestic R & D and technological capability. Maximum benefit requires a liberalisation of policies to simplify the introduction of technology from abroad. Assigning a leading role to cross-licensing with firms from advanced countries would help to up-grade the domestic capability to develop new technology. Strategic options for a more successful acquisition of technology by Korea might also include:

(i) Reinforcement of the technology transfer information system

The information exchange system between domestic information bureaus and research institutes should be networked to enhance the private utilisation of foreign and domestic technology. In particular, KIET's (Korea Institute for Economics and Technology) network should be reinforced to allow it to achieve more fully its function as a technology information centre responsible for the diffusion of technology to companies and institutions (research institutes, universities and colleges, etc.).

(ii) Promoting Korean research institutes in advanced countries and foreign research institutes in Korea

An internationalising strategy for technology development should be pursued by establishing Korean research institutes in the advanced countries which are the origins of high technology. The revision of the Foreign Exchange Control Regulation, in response to the recent steady increase in the current account surplus in Korea to US$ 6.0 bn. in the first half of 1988 (Korea Newsreview, July 30, 1988), has removed the exchange controls which would have precluded this policy in the past. Incentive systems should be adopted to attract staff from foreign research institutes to Korea.

(iii) Expansion of international joint cooperation

Joint research in the field of basic science, high technology in its developing stage and public technology should be enlarged and reinforced to cope with technology protectionism in advanced countries. To date, Korea has an agreement with West Germany to explore strategies and specific areas which will serve as the basis for cooperative scientific and technological development in the future. The two countries have also agreed on an increase in the exchange of scientists and post-doctoral research fellows (Korea Newsreview, August 13, 1988).

(iv) Incentives for international scientific and technical cooperation

The Korean government should consider the establishment of facilities to international standards for the convenience of foreign specialists during their stay in Korea when performing consultations or joint research. Furthermore, international institutes should be set up to develop relations and strengthen the exchange of information with countries with which Korea has no diplomatic relations.

(v) Liberalisation of the channels of technology transfer

As the industrial structure of Korea has become more technology-intensive, the role of technology as a leading factor in economic development has become increasingly recognised. To improve the access of Korean firms to the leading edge of technology and innovation the market channels of technology transfer should be liberalised by removing controls on inward foreign direct investment, joint ventures and licence agreements. By increasing the exposure of domestic firms to the challenge from foreign competitors, the Korean government can enhance their productivity and promote technological innovation. In fact, the Korean government has begun to implement market-opening policies under which its import liberalisation ratio[2] is expected to exceed 95.0% of full import liberalisation by 1988.[3] However, the Korean government should minimise the expected side-effects arising from liberalisation by subsidising domestic R & D programmes to encourage greater technological independence in the longer term. In effect this would replicate the industrial up-grading policies which have been successfully pursued in Japan.

(vi) Activation of joint R & D initiatives

The notion here is that research institutes should be established to monitor, and engage in, research, to facilitate cooperative research between firms and to make research findings widely available to the business community.

(vii) Activation of domestic horizontal transfers of technology

It is important not only to introduce foreign technology but also to facilitate its spread into domestic enterprises and organisations. It is proposed that financial incentives should be offered to enterprises to encourage them to adapt and improve introduced technologies.

(viii) A national manpower pool

A system should be introduced to formalise staff exchange programmes between research technologists in institutes, universities, laboratories, enterprises etc.

12.2.2 STRATEGIES FOR ENHANCING PRODUCTIVITY

In this sub-section, strategic options for improving productivity will be presented, focusing on labour-management relations in Korea. Broadly, these relate to: a) activation of Quality Circles (QC); b) changes in management styles to reflect Korean culture; and c) the modernisation of current labour-management relations.

Introduction

The number of workers necessary to produce a given volume of goods in Korea is falling. According to a 1985 employment table drawn up by the Bank of Korea (BOK) based on 1985 input-output tables, an average of 149 workers were necessary to produce one billion won[4] worth of goods in the industrial sector overall in 1975. But the number of necessary workers fell to 101 in 1980 and 69 in 1985. In the plant and construction industries, the number of workers necessary to produce one billion won worth of commodities in 1975 was 63, 44 in 1980 and 31 in 1985. The BOK attributed these reductions to an improvement in labour productivity and the modernisation and automation of facilities. In the case of Japan, the average number of workers necessary to produce one billion won worth of goods in 1985 was 23 in the industrial sector overall and 13 in manufacturing industries (Korea Newsreview, July 16, 1988).

Korea's rapid industrialisation was achieved to some extent at the expense of human resources management in areas such as occupational safety, protection of employees' basic rights and the involvement of employees' organisations in the decision-making process. Labour disputes have risen sharply since 1987, the primary direct cause being attributed to a breakdown in labour-management negotiations over wage increases, union autonomy, fair labour practices, reform of current labour laws and the liberalisation of management's authoritarian style. As a result, the Korean economy has begun to experience a sluggish production performance and slower economic growth. Korean industries are also suffering from the rapid appreciation of the won against the US dollar, a shortage of basic raw materials and rising inflation.

Miyai Jinnoske, the chairman of the Japan Productivity Centre (JPC), established in 1955 to promote employment growth, labour-management cooperation and a fair distribution of rewards, has claimed that for a movement towards higher productivity, the human side is more important than the technological side (The Joong-ang Daily News, August 27, 1988). According to Jinnoske, economic prosperity in Japan is based on high productivity, which in turn is derived from highly effective labour-management cooperation.

In recognition of the merit of this viewpoint and to dampen down labour disputes and promote industrial harmony in Korea, the following strategies are recommended:

(a) Activation of Quality Circles (QC)

A QC, typically, is a voluntary group of approximately 10 employees who participate in discussions and decisions relevant to an improvement in their organisation's productivity and product quality. QC suggestions are forwarded to upper management for consideration and, if approved, the QC group may become involved in implementing corrective actions (Lyu and Roffey, 1983). In the late 1970s, the term QC meant little to Western businessmen. Today it is receiving growing acceptance worldwide as a key management tool.

The Japanese modified and extended the quality control concept which originated in Western economies. The Western view held that success in quality control lay with managers and engineers, but the Japanese added the notion that blue-collar workers could also play a significant role in improving product quality and productivity (Kotler, Fahey, & Jatusripitak, 1985). To this group the Japanese also added product designers, marketing and sales and R & D staff. The consequence has been steady and substantial increases in Japanese productivity and product quality.

(b) Improving the Korean Management Style

Sullivan and Nonaka (1986) compared American and Japanese management in terms of organisational behaviour. Americans behaviour, they argued, is rooted in the dictates of an internalised set of rules and purposes modified by a strong sense of self. Information is used to transpose internal needs and desires into successful external action, but communication systems become self-oriented and goal-achieving, and can be characterised as pointed and often confrontational. Among the Japanese, however, rules and purpose are tied more closely to the demands of tasks, situations and context. The self merges into the group, and information is used to develop feelings and postures adaptive to the group and the context.

Sarathy (1985) claimed that Japanese individuals are not individualistic in a Western sense: rather, they feel their primary obligation to be towards the group of which they form a part, such groups being the family, the clan, the company and so forth. In return, the group does its utmost to take care of its members. Therefore, problems of labour-management relations can be approached more effectively through the application of the familial concepts of benevolence and reciprocity. The consequences of such a way of thinking include the use of the resort to group-based decision making and control systems and lifetime employment, each of which offer the firm several advantages. For example, the firm is assured of a constant supply of labour that can be trained without losing the "investment" to another firm. The workers feel more loyal to the firm and see their prosperity as being tied up with the firm's prosperity. This management style, rooted in Japanese culture, has contributed greatly to her industrial productivity, which has overtaken the United States and Western European countries in some industries, such as steel, electrical machinery and motor vehicles.

The Korean economy has been heavily dependent on the United States since World War Two. Thus, it has been natural for Korean firms to imitate the management style emanating from the USA. By the year 2000, college graduates will occupy about 20.0% of the labour force, and either high school graduates or college graduates will be more than 55.0% of the labour force (see Table 12.1). This generation, more highly educated and exposed to western-style liberalism and individualism, will harbour much higher expectations, such as equitable treatment, political participation and an improved social welfare system. Therefore, the current authoritarian and paternalistic system of labour-management relations will be seriously challenged.

TABLE 12.1

POPULATION BY LEVEL OF EDUCATION: 1980-2000

Unit: '000 persons, ( ) %

	1980		1990		2000	
Population aged 14 & over	24,848	(100)	32,385	(100)	37,823	(100)
- High school graduates	4,383	(17.6)	8,174	(25.2)	11,102	(29.3)
- College students	721	(2.9)	1,787	(5.5)	2,213	(5.9)
- College graduates	1,329	(5.4)	3,877	(12.0)	7,511	(19.9)
High school and college graduates	6,433	(25.9)	13,838	(42.7)	20,826	(55.1)

Source: Korea Development Institute, Korea Year 2000, Summary report, Seoul, Korea, 1986, pp.29.

However, the Korean's way of thinking is closer to that of the Japanese, with whom there are closer psychic ties (e.g. similarities in culture, business and customs) than to the American. Thus, it would make sense for Korean firms to develop their own native management style, selecting the advantages of the Japanese management style: lifetime employment; a strong sense of belonging to a group and community; a tendency toward self-effacement and responsibility to the group; a willingness to work hard and persevere toward long-range goals; and a strong belief that competence increases with seniority.

(c) Modernising Current Labour-Management Relations

Since manpower will be the important and crucial resource driving Korean international competitiveness, labour can no longer be regarded only in its pure economic dimension as a factor of production, but should be regarded for its social dimension. Moreover, as the industrial structure becomes more technology and capital-intensive, the social cost of industrial unrest or, conversely, the social benefit of industrial peace will tend to rise substantially.

Thus, it is inevitable that Korea will have to pursue the modernisation of labour-management relations in the coming decade, in particular paying attention to : a) a recognition of the democratic and autonomous rights of unions and a guarantee of free collective bargaining; b) prompt and strong intervention by government in cases of unfair labour practices; c) a neutral and non-interventionist position of government in cases of "self-interest", such as wage negotiations; d) developing more responsive union leadership; and e) leadership training and general employees' education on union matters both at the government and the union level. If the modernisation of current labour-management relations is performed successfully, employers and employees will gradually learn to appreciate the advantages of free collective bargaining and the importance of mutual interdependency. As a result, the strategic options presented above may contribute substantially to improving the productivity and export performance of the Korean plant and construction industry.

12.2.3 STRATEGIES FOR ADJUSTING INDUSTRIAL STRUCTURE

To sustain high economic growth, it is inevitable that Korea will continuously adjust its industrial structure on the basis of international comparative advantage.

The Korean economy experienced dramatic structural changes in the 1970s, namely rapid heavy industrialisation constrained by a relative scarcity of capital. Thus, the Korean government came to be heavily dependent on foreign savings throughout the 1970s. The limited capital was allocated according to the priorities set by the government through the government-controlled banking system or through direct governmental lending and investment. However, in the course of hasty government-led heavy industrialisation an overcapacity problem emerged in several heavy industrial sectors after the second oil crisis and the subsequent world-wide recession.

In response, in the early 1980s, the government imposed a rationalisation scheme in several heavy industrial sectors, including power generating equipment, heavy construction equipment, heavy electrical machinery, electronic communication equipment and copper refining. However, the scheme was essentially designed to solve the managerial difficulties caused by an underutilisation of capacity. Accordingly, little investment was made in these heavy industries in the recovery phase of the business cycle in the early 1980s, since when Korea's industrial adjustment has involved a rapid shift to a more technology-intensive structure.

Table 12.2 shows the proportional changes in Korea's industrial structure. Korea has experienced a relative decline in agriculture, forestry, fisheries, mining and light industry. "Other services" retained their importance. The significance of heavy and chemical industries increased (to 28.3% from 26.3%); light industries, such as food, beverage, tobacco, textile, clothes and footwear, showed a quite substantial fall (to 21.7% from 24.7%).

TABLE 12.2

PROPORTIONAL CHANGES IN KOREA'S INDUSTRIAL STRUCTURE

Unit: %

Item	1975	1980	1985
Agriculture, forestry, fisheries	12.8	8.3	7.7
Mining	0.9	0.8	0.7
Manufacturing	50.5	51.0	50.0
(Light industry)	(29.8)	(24.7)	(21.7)
(Heavy and chemical industry)	(20.7)	(26.3)	(28.3)
Electric, gas, piped-water, and construction industry	7.7	10.2	10.4
Other services	28.1	29.7	31.2
Total	100.0	100.0	100.0

Source: Korea Newsreview, April 2, 1988.

Such changes in Korea's industrial structure can be partly explained by changes in the domestic demand structure as real incomes increased, the process of industrialisation, shifts in demographic characteristics and changed conditions in the factor market and domestic technological development. In addition to these autonomous domestic factors, many external factors also exerted an influence, including: the two oil price shocks and the resulting changes in the level and structure of world demand, rapid technological change in the developed countries, the process of industrialisation in some developing countries, wage competition from LDCs and the growth of protectionism.

Government induced changes in Korea's industrial structure were necessary to cope effectively with this rapidly changing economic climate, which also was affected by high wage settlements following labour disputes, the rapid appreciation of the won and increased pressure from advanced countries to open the local market wider. Since Korean firms are under-capitalised and recently privatised banks have neither the experience nor the capital to accept a leadership role in managing sunset industries, the Korean government has taken an active role in adjusting industrial structure.

An industry may become depressed for cyclical or structural reasons. The overseas construction industry is one such case. In the process of adjustment, the government forced through mergers between weak and stronger firms and provided banks with special credit to enable firms to roll over their massive debts.

The government had to depend on the large firms to adjust the industrial structure because of the inexperienced financial sector. In effect, industrial concentration was subsidised from public funds to stave off large-scale bankruptcies. The degree of intervention was on such a scale that individual decision-makers were often sheltered from losses and the rewards for risk-taking were not offset by penalties for weak performance. Heavy government subvention also prevented the vital function of reallocating capital from declining to emerging industries from being implemented.

Under these circumstances, strategies for further adjustment of the industrial structure might include:

(a) Financial Reform

Korea is required to strengthen its banking sector because the fragility and immaturity of capital markets makes the absorption of losses and redeployment of capital much more problematic. The current capital to asset ratio is inadequate with respect to the size of non-performing assets. Outstanding BOK (Bank of Korea) loans to the government ministries amounted to 2,160.2 billion won (about USB$ 2.7) at the end of October 1987, up 5.1% from 2,055.5 billion won at the end of 1986. The Bank's operational deficit was estimated to 200 billion won in 1987 as against 132.3 billion won in reserve funds, resulting in a 67.7 billion won shortfall in reserves in 1987 (see Table 12.3).

TABLE 12.3

BOK'S DEFICITS, RESERVES AND LOANS TO GOVERNMENT

Unit: billion won

Year	Deficits	Reserves	Loans to gov't
1984	194.8	372.0	2,072.1
1985	130.6	189.5	2,065.5
1986	57.2	132.3	2,055.5
1987[1]	200.0	-67.7	2,160.0

Source: <u>Korea Newsreview</u>, December 19, 1987.
Note: 1. 1987 figure is estimated.

(b) Autonomy for the Bank of Korea.

Bankruptcy proceedings serve a useful purpose in that they provide firms with legal exit from an industry and a framework for loss-sharing. Greater central bank independence provides another buffer and precludes the use of public funds for struggling companies without public accountability. Accordingly, it is recommended that the chairman of the Monetary Board should concurrently serve as a governor of the Bank of Korea to ensure the latter's independence and neutrality when formulating and implementing the nation's monetary and credit policies.

(c) Less dependence on the Government.

Until now, Korean enterprises have relied on the government to be the ultimate risk-bearer. This should be changed as the economy grows in sophistication, and losses should be borne increasingly by private agents, both domestic and foreign. This change is essential if Korea is to deal with declining industries efficiently and rationally.

(d) Reduced Governmental Intervention

The process of structural adjustment should be left primarily to market forces and the principle of free competition, which require individual enterprises to make the appropriate decisions.

(e) Institutional Reforms by the Government

The government should carry out institutional reforms, including the introduction of incentives to appropriate manufacturing industries in rural areas and the expansion of investments in social overhead capital. It is also important to provide incentives to maximise domestic savings and to facilitate investment in production equipment, both for capacity expansion and replacement of inefficient production units. However, the government should be extremely careful in providing sector specific incentives because direct intervention by the government can hardly be justified.

(f) More Power to the Fair Trade Committee

To prevent excessive concentration of economic force on a few business conglomerates, the government should grant more power to the Fair Trade Committee of the Economic Planning Board.

(g) Employment and Labour Relations.

The government should exert its best efforts to minimise the possible negative impact of rapid industrial restructuring on employment and labour relations. This can be accomplished by helping to bolster job training and retraining programmes, to improve and enlarge employment services, and to build up a fair system of labour relations.

12.2.4 STRATEGIES FOR CULTIVATING SMALL AND MEDIUM-SIZED ENTERPRISES

Definitions of small and medium-sized enterprises (SMEs) vary widely among economist. Moreover, definitions differ by country, each having different cultural, political and economic backgrounds, different compositions of industries and different stages of economic development.

The legal definition for SMEs in Korea is found in the Small and Medium-sized Industry (SMI) Basic Act. One of the primary criterion in defining an SME is the number of full-time employees. Basically, those enterprises in manufacturing, mining and transportation with 20 full-time employees or less are defined as small, while those with less than 300 but more than 20 full-time employees are medium. However, according to the Enforcement Decree of the SMI Basic Act, SMEs in some industries may include firms with up to 700 employees, in which case, they are also defined by the total asset criterion. Accordingly, in the industries listed in the Decree, SMEs should meet both the employee and asset criteria to benefit from SME promotion policies and measures.

The share distribution of SMEs by industry in Korea is shown in Table 12.4, which assumes that enterprises which have 300 full-time employees or less fit best statistically into our legal definition of SMEs.

More than 97% of total enterprises are SMEs, except in the basic metal, textile and chemical industries. The employment share of SMEs is the highest in paper and paper products, printing and publishing industry (72.8%) and wood and wood products industry (65.3%), and least in chemicals, petroleum, coal, rubber and the plastics industry (44.2%). In terms of value added, non-metallic mineral products industry is the highest (63.9%), followed by paper and paper products, printing and the publishing industry (58.0%).

TABLE 12.4

THE SHARE DISTRIBUTION OF SMEs BY INDUSTRY IN 1982

Unit: %

Industry	Enterprise		Employment		Value Added	
	5-200	5-300	5-200	5-300	5-200	5-300
Manufacturing	95.2	97.3	44.9	53.8	27.9	36.2
Food, Beverages & Tobacco	96.8	97.8	51.5	57.8	21.7	27.8
Textile, Wearing, Apparel & Leather	93.8	96.6	45.5	55.4	33.7	42.8
Wood & Wood Products Incl. Furniture	98.5	99.1	59.6	65.3	46.9	54.5
Paper & Paper Products, Printing & Publishing	97.3	98.6	62.9	72.8	44.8	58.0
Chemicals, Petroleum, Coal, Rubber, Plastic	94.1	96.7	35.5	44.2	24.0	35.2
Non-Metallic Mineral Products	96.2	98.0	52.1	64.4	52.5	63.9
Basic Metal Industries	92.9	95.7	37.0	44.7	14.6	19.2
Fabricated Metal, Machinery & Eqipment	95.0	97.0	40.2	47.9	25.0	31.2
Others	94.3	97.7	55.7	71.0	50.8	66.5

Source: Economic Planning Board, Reports on Mining and Manufacturing Survey, The Republic of Korea (Seoul), 1983.

According to statistics available at the Ministry of Trade and Industry, small and medium-sized industries accounted for 33.7% of the Korea's total exports in the first quarter of 1988, and for 37.7% in 1987 and 35.2% in 1986 (Korea Newsreview, July 30, 1988).

The SMEs in Korea are mostly sub-contractors, specialising in the production of parts and components. They are far more labour-intensive than large enterprises, which play a more important role in assembly line production. Incentives could be used to nurture the optimisation of integration between large assembly industries and small component suppliers. The infrastructure supporting such integration remains rather backward in Korea in several respects. For example, guidance and training is rarely offered to suppliers for lack of experienced training personnel; large businesses are tied up with the expansion of their industry; increased credits from foreign sources contribute little to alleviate financial stress in small and medium industries in difficulty; and personnel recruited from research institutions or academic circles are, by and large, employed on a part-time basis or inexperienced. Such inadequacies in the infrastructure for the promotion of small and medium industries cannot be remedied in the short term.

It is desirable that the development of both capital-intensive and labour-intensive industries should grow in parallel with the development of small and large industries. The parallel growth of large assembly and small ancillary industries in postwar Japan took place in a highly competitive climate: large assembly industries were extremely selective in their choice of ancillary suppliers, which were then given meticulous training. The role of the Japanese government was only to stage the most efficient and competitive economic environment and to promote a sense of self-reliance. The parallel development of large and small industries in Japan has inspired a sense of interdependence between them, thereby accelerating technical assistance and technology transfer from large assembly industries to small ancillary firms.

In contrast, the Korean pattern of industrialisation has been lop-sided. Small and medium ancillary industries have been unable to keep pace with larger assembly industries in the process of rapid, export-led industrialisation over the past decade because of their technical incompetence. In addition to this, there are other problems with which Korean small and medium enterprises are confronted. Thus, financial aid to small and medium business concerns has been unsatisfactory as it has been provided on an inflexible long-term basis; the majority of such aid is carried over in the supplementary budget, thereby delaying the supply to small and medium industries; special loans in foreign exchange, set aside to help business, are virtually shut off to small and medium business concerns as these loans are generally limited to firms with import facilities; and the lacklustre performance of smaller companies in Korean export markets testifies to the indifference of various government organisations.

At the beginning of 1988 the Korean Ministry of Trade and Industry announced a wide range of measures to foster small and medium business concerns, recognising that, in particular, the development of SMEs in the manufacturing sectors is essential for further development of large industries and thus for the Korean economy. The targets included increasing the share of small and medium business in Korea's total exports to as high as 40.0% compared with 37.7% in 1987, and the designation of some 1,000 promising small companies (Korea Newsreview, July 30, 1988).

The following steps would improve the technical capabilities of small and medium enterprises in Korea.

(a) Government intervention to enhance the technical capabilities at the small and medium industry level should be minimised, partly because large industries are better suited for that purpose, and partly because small enterprises often fail to respond to government incentives and schemes.

(b) A spirit of interdependence between large and small industries should be fostered. For this purpose an existing advisory committee, such as the Korean Federation of Small Businesses, should be organised to promote greater cooperation.

(c) A strong network at local government level should be established to promote local industries. Decentralisation would give tacit recognition to the fact that economic activity has outgrown the current level of direct government control.

(d) Entrepreneurs of high quality should be identified and their experience and expertise made available to small industries.

(e) The export of plant and equipment is nowadays contracted mostly under consortium arrangements entered into between large and small machine manufacturers at home and abroad. The formation of international consortia should be encouraged in Korea so that small and medium-sized plant exporters may gain easier access to the world plant market.

(f) To reinforce the fund which supplies long-term deferred payment finance to domestic machinery manufacturers, the government should expand its financial aid to small and medium-sized business concerns.

(g) Many policy-makers and businessmen in Korea have claimed that large enterprises are in a better position to improve productivity because of their advantage in acquiring foreign technology and market information. It is logically correct that enterprises who receive technologies transferred from advanced countries are likely to be more efficient at making technology improvements. In the case of Korea, however, this hypothesis has been partially disproved empirically because Korea's small and medium-sized industries have been shown to be more aggressive in adopting technology improvements. Their level of technology evaluated in terms not of engineering standard but of monetary value is actually comparable to that of large enterprises. Therefore, policy-makers and businessmen should get rid of this prejudice and promote the parallel development of large and small industries.

12.2.5 STRATEGIES FOR PENETRATION OF OVERSEAS MARKETS

An improvement in both the quality of overseas information collecting systems and international cooperation (through consortia or joint-ventures) are regarded as essential strategies for further advances into overseas markets by Korean plant and construction firms.

Improving the Quality of Overseas Information Collecting Systems

An urgent problem to be solved by Korean firms intent on expanding their plant and construction exports is to strengthen their ability to bid successfully for orders. For this purpose, it has been recognised that the collection of correct information from abroad and a systematic analysis of related data through advanced data banks is essential. The information collecting channels which Korean enterprises presently use include: 1) overseas branch offices; 2) dispatching personnel to make on-the-spot enquiries; 3) KOTRA (the Korean Trade Promotion Corporation); 4) KIET (Korea Institute for Economics and Technology); 5) agents; 6) the Korean Embassies overseas; and 7) the mass communication media, etc.

The establishment and operation of an exclusive information network could be the most effective information channel available to each enterprise. However, it is estimated that most Korean plant and construction firms cannot afford such networks due to their inadequate financial ability and lack of specialist manpower.

Under these circumstances, the strategic options available for collecting rapid and accurate information are reduced to: a) organisations such as KIET, KOTRA, and the Korean embassies and delegations abroad; b) greater cooperation between government departments, trade associations, institutions, enterprises and research institutes associated with plant and construction exports; and c) a consistent statistical yearbook relating to the plant and construction exports published annually by organisations such as the Overseas Construction Association of Korea (for construction exports) and the Industrial Installation Export Association of Korea (for plant exports).

International Cooperation through International Consortia or Joint-Ventures

The growth of international economic activity, the deepening of economic interdependence among nations, and a recently stagnated world demand have been accompanied by increasing international cooperation in the field of overseas plant and construction projects.

From the point of view of exporting countries, the following economic factors have further relevance to the trend towards such cooperation:

(a) Overseas projects have become huge and complicated. Thus, a single company cannot possibly handle all the details associated with the logistics of supplying the necessary materials, equipment and many kinds of technology used in the facilities.

(b) Since the period of low growth, it has been deemed more prudent to compete for orders in combination with partners who are strong in specific technical areas or who have strong relations with certain clients.

(c) Companies prefer joint projects because they can avoid heavy capital investment that would leave facilities idle if a project, on completion, leaves them with no follow-up orders. They also prefer the protection cooperation offers against the risks associated with expanding their organisation.

(d) The need to comply with host country demands for cooperation in the development of local industry.

(e) The need to share the country risk associated with overseas plant and construction projects. The funds required for large-scale projects in the developing countries are at such a level that financial institutions in exporting countries are anxious to share the risk. In addition, the performance bond required to guarantee the execution of a contract is often so large that no one company can bear the burden.

The situations faced by plant and construction <u>importing</u> countries differ from those faced by exporters in the following respect:

(a) Importing countries wish to take advantage of the most advanced technologies and to reduce construction costs. This they do by dividing up projects as much as possible and placing orders with companies which cooperate in the transfer of technology.

(b) Importing countries also prefer dealing with international consortia whose members consist of companies from countries which have agreed either to purchase the goods produced by the new plant or to enter into counter-purchase agreements.

(c) Since the resource requirements are so great, importing countries require financial assistance from several countries.

(d) With the shift to floating exchange rates, it has become necessary to adopt policies designed to avoid exchange risks. Hence, importing countries seek to minimise exchange risks by inviting suppliers from several countries.

As explained above, international cooperation on overseas plant and construction projects has become both a necessary and an important part of the world economic scene. The overall benefit is that an international consortia or joint-venture is able to pool the resources of the partners so as to compensate for the weakness of individual parties and achieve synergy. However, there are some problems which commonly confront members of international consortia and joint-ventures.

Because there are differences among nations in language, culture, religion, customs and ways of thinking, each member of a consortia or joint-venture is required to seek a compromise on, for example, methods of estimating costs, sharing risks, project management and decision-making. In addition, since much of the R & D and managerial know-how of individual members becomes known to each other, mutual trust among members is essential. There are also other problems associated with taxation and anti-monopoly laws.

Under these circumstances, the strategies available from international cooperation include the following:

(i) Increasing Cooperation with a Third Country in Asia

East Asia contains a large proportion of the world's population and resources, and the expected future economic growth in the region promises that it will be the new centre of industrial activity.

So far, most of the plant and construction markets in Asia have been dominated by Japan. However, Japan's strong presence in Asia is on the ebb because of the strong yen, which has made Japanese commodities less competitive. Therefore, Korea is in an ideal position to capture a greater share of the region's markets for small and medium-sized plant which the region requires for its development projects. Korean contractors are increasing their endeavours to capture these markets be entering into collaborative agreements with partners from Asian countries.

The Korean government has set up a 60 billion won state-managed External Economic Cooperation Fund (similar to Japan's Overseas Economic Cooperation Fund) to grant credit on exports of industrial facilities to Asian nations.

In tandem with this initiative, the Korean government should urge Korea's general trading companies now operating in South-East and South-West Asia to expand their branch networks to improve their follow-up service and to enter into joint-ventures in the region. In paticular, the Korean Society for the Advancement of Machine Industry (KOSAMI) should be encouraged to identify those small and medium-sized industrial plant firms that are likely to be competitive in the South-East and South-West Asian market, while the Korean Trade Promotion Corporation should identify the specific equipment that the Asian countries need. In addition, the Korean government should promote countertrade arrangements in a bid to increase its trade with South-East and South-West Asia.

(ii) Increasing Cooperation between Korea and Japan

Japanese firms have recently suffered from a continuous appreciation of the yen, thereby weakening their competitive power in plant and construction export markets. In the case of Korean firms, even though their price competitiveness has improved because of the appreciation of Euro currencies and the Japanese yen, their plant and construction exports have stagnated due to the lack of technology and experience. Accordingly, this may be the most appropriate time to explore the notion of international consortia cooperation between both Korea and Japan. This would allow two geographically close and culturally similar countries to mutually alleviate various risks and financial burden associated with plant and construction exports, greatly strengthen their price competitiveness by exploiting their respective comparative advantages, and avoid the trade discord that would otherwise result from excessive competition between the two countries.

In the event of mutual consortium arrangements, information could be shared with regard to international tenders, Japanese firms could specialise in component design and project supervision, while Korean firms could concentrate on the establishment and supply of machinery and parts and both countries could share the responsibility for suppliers' credit.

(iii) Standard Agreements for International Consortia

The Japan Machinery Exporters's Association has already drawn up a standard agreement for international consortia for use in bidding for and implementing turnkey projects. This agreement, which is called the "Consortium Agreement for Tender and Execution of Turnkey Projects", was produced in cooperation with the industries involved (Maeda, 1983). KOSAMI should also draw up a standard agreement for international consortia for tender and execution of turnkey projects for the benefit of Korean firms when forming consortia with non-Korean firms.

12.2.6 IMPROVING GOVERNMENTAL SUPPORT SYSTEMS

Governmental support systems might be improved in various ways, such as the expansion and efficient deployment of external economic cooperation funds and deferred-payment funds, improvements to export insurance systems, tariff and taxation support systems, simplification of export procedures and inducements for the formation of international consortia and a strengthening of trade relationships.

12.2.6.1 EXTERNAL ECONOMIC COOPERATION AND DEFERRED-PAYMENT FUNDS

It has been recognised that a budget limit on suppliers' credit has an important influence on the success or failure of plant and construction exports. In general, all funds related to plant and construction exports, including the external economic cooperation fund and the deferred-payment fund, should be continuously expanded.

The External Economic Cooperation Fund

The 60 billion won state-managed External Economic Cooperation Fund will be expanded to 520 billion won by 1991 to finance credit on exports of industrial facilities to Asian nations (Korea Newsreview, October 10, 1987).

A priority should be given to suppliers' credit on large-scale plant and construction projects in the public sector, such as power generating equipment, petrochemical installation and iron and steel manufaturing equipment.

Buyers' credit extended by Korea to South-East and South-West Asia should also be expanded to match the level of mixed credit and tied loans* offered by the Japanese in this region. The Korean fund (60 billion won), established in 1987, was equivalent to only 2.4% of the Japanese Overseas Economic Cooperation Fund in 1984 (Korea Society for the Advancement of Machine Industry, 1987).

In the event that Korean firms establish joint-ventures in the region, the Korean government should subsidise a portion of the investment from the external economic cooperation fund.

The Korean government should also subsidise the expenses incurred by plant and construction firms in exploring cooperation agreements with overseas firms.

Deferred-Payment Funds

Table 12.5 shows the change in export credit commitments and loan disbursements on deferred-payment associated with the support fund for industrial plant exports from Korea. During 1978-87 export credit commitments rose at an average annual growth rate of 54.7% compared to 24.5% for loan disbursements. The large decrease in loan disbursements since 1985 and in export credit since 1984 reflects the recession in international plant construction markets in the Middle-East.

The change in suppliers' credit on deferred-payment by Korea is presented per item in Table 12.6. During 1978-87 shipbuilding, on average, shared 80.5% of total suppliers' credit on deferred-payment, while industrial plant shared only 18.3%. In some years it can be observed that the export fund gave very little assistance to industrial plant exports.

TABLE 12.5

THE CHANGE IN EXPORT CREDIT COMMITMENTS AND LOAN DISBURSEMENTS ON DEFERRED-PAYMENT

Unit: In Million of Won

Year	Export Credit Commitments (A)	Loan Disbursements (B)	B/A X 100 (%)
1978	119,792	105,091	87.7
1979	410,343	146,198	35.6
1980	252,628	296,280	117.3
1981	552,230	504,826	91.4
1982	570,813	634,486	111.2
1983	603,803	667,903	110.6
1984	1,120,065	831,293	74.2
1985	759,336	840,124	110.6
1986	314,444	612,850	194.9
1987	835,724	484,349	58.0
Increasing rate (1978-87)	54.7 %	24.5 %	

Source: The Export-Import Bank of Korea, A Monthly Report of Investigation by the EXIM Bank of Korea, Vol. 7, No. 7, July 1988, pp. 78-81.

It is recommended that Korean export finance should a) begin to favour industrial plant instead of shipbuilding, b) make greater use of low interest loans, c) simplify procedures and apply more generous credit ratings, and d) extend loan repayment periods.

TABLE 12.6

THE CHANGE IN SUPPLIERS' CREDIT ON DEFERRED-PAYMENT (BY ITEM)

Unit: In Million of Won, ( ) %

Item / Year	Industrial plant	Ships	Rolling stock	Machinery & others	Total
1978	84,182 (70.3)	22,946 (19.2)	--	12,664 (10.6)	119,792 (100.0)
1979	5,348 (1.5)	345,157 (96.8)	1,747 (0.5)	4,396 (1.2)	356,648 (100.0)
1980	48,148 (19.2)	197,106 (78.5)	2,570 (1.0)	3,263 (1.3)	251,117 (100.0)
1981	2,686 (0.5)	525,710 (98.1)	--	7,480 (1.4)	535,876 (100.0)
1982	7,676 (1.5)	495,303 (97.1)	--	7,188 (1.4)	510,167 (100.0)
1983	68,025 (13.2)	439,293 (85.5)	--	6,650 (1.3)	513,968 (100.0)
1984	180,117 (16.1)	939,205 (83.9)	--	743 (0.1)	1,120,065 (100.0)
1985	330,317 (43.5)	423,378 (55.8)	5,641 (0.7)	--	759,336 (100.0)
1986	131,667 (41.9)	180,114 (57.3)	2,663 (0.8)	--	314,444 (100.0)
1987	114,675 (13.7)	710,000 (85.0)	--	11,049 (1.3)	835,724 (100.0)
Average	97,284 (18.3)	427,821 (80.5)	3,155 (0.6)	6,679 (1.3)	531,714 (100.0)

Source: See Table 12.5.

12.2.6.2 IMPROVEMENT OF THE EXPORT INSURANCE SYSTEM

Plant and construction exports are subject to deferred-payment transactions and software efficiency guarantees. The risks associated with the characteristics of the market have been compounded in recent years because of the increasing scale of projects and because the settlement method has been universally converted from L/C (letter of credit) to D/P (document against payment) and D/A (document against acceptance) methods. In addition, there are country risks associated with political, economic and social instability in the developing world. Insurance reduces the risk burden.

Table 12.7 shows Korean export market insurance, by insurance type, since 1977. The insurance of overseas construction works (sharing 40 % of the total) increased markedly until 1982 in tandem with the growth of markets in the Middle-East. Since 1983 this type of insurance has not been in evidence. Insurance of medium and long-term credit on deferred-payment, which is mainly linked to industrial plant exports, has steadily increased up to 1985, sharing 84.2 % of the total insured amount in 1985. In 1987 the insurance in export markets dropped below the level of 1980 in reflection of the severity of the depression and the competitiveness in world markets.

The lack of growth in insurance cover during the 1980s can be attributed to the fragile export base of plant and construction firms, their failure to appreciate the value of insurance cover and complicated application procedures.

The insurance service to exporters could be improved as follows: i) widening the scope with respect to region and type of transaction; ii) a reduction in insurance rates; iii) the introduction of insurance schemes to cover exchange fluctuations, consortium risks, inflation and general all-purpose insurance; and iv) sharing and diversifying risk by encouraging joint insurance cover from private insurance companies and the Export-Import Bank of Korea.

TABLE 12.7

KOREAN EXPORT MARKET INSURANCE (1977 - 1987)

Unit: In Million of Won

Type / Year	Export bill insurance	Medium & long-term credit	Overseas constrn insurance	Export bond insurance	Others'	Total
1977	28,440 (56.7)	3,037 (6.1)	---	---	18,707 (37.3)	50,184 (100.0)
1978	19,546 (29.6)	31,796 (48.1)	10,086 (15.3)	---	4,609 (7.0)	66,037 (100.0)
1979	16,546 (6.4)	29,720 (11.5)	204,914 (79.1)	---	8,410 (3.2)	259,140 (100.0)
1980	17,090 (3.5)	50,794 (10.3)	82,100 (16.7)	333,539 (67.9)	7,859 (1.6)	491,382 (100.0)
1981	22,202 (1.5)	71,989 (4.8)	445,164 (29.4)	951,524 (62.9)	21,561 (1.4)	1,512,440 (100.0)
1982	24,896 (1.7)	147,105 (10.2)	576,888 (40.1)	627,826 (43.7)	61,043 (4.2)	1,437,758 (100.0)
1983	22,478 (2.3)	579,288 (59.1)	28,104 (2.9)	188,128 (19.2)	161,812 (16.5)	979,810 (100.0)
1984	60,756 (4.8)	714,742 (57.1)	---	328,534 (26.2)	146,762 (11.7)	1,252,794 (100.0)
1985	73,579 (5.5)	1,126,281 (84.2)	---	58,361 (4.4)	79,438 (5.9)	1,337,649 (100.0)
1986	71,637 (6.8)	824,657 (78.3)	---	51,051 (4.8)	105,500 (10.0)	1,052,846 (100.0)
1987	44,658 (10.4)	236,136 (54.8)	---	32,571 (7.6)	117,692 (27.3)	431,057 (100.0)

Source: See Table 12.5.

Note: 1. Others include investment insurance, general export insurance, export finance insurance, buyer credit insurance and consignment export insurance.
2. ( ) share ratio, %.

12.2.6.3 THE IMPROVEMENT OF THE TARIFF AND TAXATION SUPPORT SYSTEM

Korea's increasing trade surplus, which reached USB$ 7.27 during the first nine months of 1988 (The Joong-ang Daily News, October 27, 1988), is partly a consequence of high tariffs which are two or three times higher than those of its major trade partners. These tariffs have attracted considerable criticism in international trade negotiations. Across-the-board tariff cuts would sharpen Korean enterprises' international competitive edge, stablise domestic prices, increase consumers' welfare and ease trade friction with major partners.

As shown in Table 12.8, a package of tariff cuts was finalised in April 1988 by the Deliberation Committee for Reconstructing the Tariff System (Korea Newsreview, April 30, 1988). According to the schedule, the tariff levied on the majority of industrial products will be gradually reduced to 8.0 % from the current 20.0 % by 1993. The tariff on non-competitive materials which are not produced in Korea will be lowered from 5.0 % in 1988 to 1.00-2.00% in 1989. Tariffs on imported materials for which there is domestic competition, including substitute materials, will be gradually reduced from 10.0 % to 3.0 % in the five-year period from 1989.

Average tariff rates in other countries in 1987 were 5.9 % for Japan, 6.2 % for the United States and 7.9 % for the European Community, and 11.7 % for Taiwan in 1988, compared with 18.1 % for Korea in 1988 (Korea Newsreview, April 30, 1988). To achieve parity with other countries the Korean government should plan to impose even greater cuts to the agreed schedule, but on a step-by-step basis to give domestic industries time to adjust. In addition, we recommend that: a) the tariff reductions or exemptions should apply to imports of machinery, materials, and equipment necessary to the overseas plant and construction industry; b) relief on corporate tax in some fixed proportion to a firm's export ratio; c) the availability of funds to compensate exporters against non-payment; d) creation of a fund to subsidise the cost of marketing research overseas; and e) an extension of the fund to subsidise technology development in engineering companies and machinery manufacturing companies.

TABLE 12.8

KOREA'S PLANNED TARIFF SCHEDULE: 1989-93

Unit: %

Classification	Major items	1988	'89	'90	'91	'92	'93
Industrial products	most finished goods	20	15	13	11	9	8
	garment, electronics	30	20	16	13	10	8
	automobile, jewellery	50	20	16	13	10	8
	farming machine, rolling stock and medical equipment	15	15	13	11	9	8
Agro-fisheries products	meat, chocolate	30	30	30	25	25	20
	dairy products, coffee	40	35	35	30	30	25
	fruit, vegetable	50	40	40	40	35	30
	wine, tobacco, banana	100	50	50	40	40	30
Raw materials	raw ores	5	1-2	1-2	1-2	1-2	1-2
	raw rubber, raw-hide	10	5	5	4	4	3

Source: Korea Newsreview, April 30, 1988.

12.2.6.4 SIMPLIFICATION OF EXPORT AND ADMINISTRATIVE PROCEDURES

The current system of tax relief and financial support to promote plant and construction exports has led to inefficiencies associated with complicated and time-consuming administrative procedures, consultative processes and the degree of duplication involving different agencies and government departments. Because of this, many exporters have failed to take advantage of the support services that are available. It is proposed, therefore, that procedures should be greatly simplified and administered by a single agency responsible for international trade.

The Industrial Installation Export Association of Korea, which has been recently inaugurated, could establish a data bank to supply up-to-date information on overseas markets.

12.2.6.5 INTERNATIONAL CONSORTIA AND TRADE DIPLOMACY

The enterprises of developed countries, including the European Community, have recently seen the merit of forming international consortia to share the various risks associated with increasingly large overseas plant and construction projects, to jointly raise funds for large-scale projects and to pool technical knowledge.

The emergence of international consortia offers new opportunities to Korean firms, which are generally relatively weak with respect to technology, experience, finance and information networks. Accordingly, the Korean plant and construction firms should assess the strategic significance of membership of such a consortia.

Most plant and construction exports form part of the economic development programmes of LDCs and most importers are government authorities. Successful exporting, thus, requires a high and sophisticated level of trade diplomacy, increasingly promoted and sustained by firms rather than embassies. A Korean business executive has said, "Gone are the days when trade-diplomacy was monopolised by the government. We will force our way through the tough trade impasse in an all-out trade-diplomacy era" (Korea Newsreview, March 26, 1988).

Since many countries, including the United States, have taken steps to protect their home markets against Korean goods, Korean businesses should consider the advantage of employing foreign lobbyists, consultants and lawyers to defend them in protectionist lawsuits. In particular, the Korea Foreign Trade Association should play a more forceful role in reducing trade friction between Korea and its trading partners.

12.3 POLICY RECOMMENDATIONS

The proposed policy recommendations aim at pursuing a more successful performance by Korean plant and construction firms in international markets. The recommendations, which are made to Korean firms and the Korean government, focus on technological innovation, productivity improvements, international cooperation and governmental support systems.

12.3.1 RECOMMENDATIONS TO KOREAN PLANT AND CONSTRUCTION FIRMS

With regard to Korean international competitive power as estimated by Korean firms (Chapter 11), Korean plant and construction firms appear to compete successfully against advanced industrial countries with respect to price and delivery, but experience technological weaknesses. In particular, the research has shown that with respect to engineering ability (i.e. feasibility studies, design ability, consultancy and specification) Korean firms believe themselves to be much inferior to their developed country competitors. An increased commitment to improving the technological quality of Korean products and maintaining price competitiveness are high priorities.

With regard to technology transfer, Korean firms should focus on European technology supplies as well as those of the US and Japan, import more unpackaged technology via the licensing of patents and develop their own in-house research and development.

There are already signs that Korean firms are facing increasing price competitiveness from South-East Asia. Hence, Korean firms need to be made aware that this traditional strength cannot be sustained without constant attention to minimising possible units costs of production. However, attempts to develop sound labour-management relations should not be neglected. Policy recommendations for productivity improvements are proposed as follows:

1. Korean firms should introduce quality circles to improve productivity.
2. They should develop Japanese-style management techniques.
3. They should modernise their current labour-management relations, namely, a) recognise the autonomy and democratic rights of the unions, b) guarantee free collective bargaining, c) encourage a more responsive union leadership.

Korean plant and construction export firms should take steps to improve cooperation with importing countries through trading links, joint-ventures and technical agreements. Close attention should be given to the provision of acceptable credit terms, the avoidance of excessive competition among Korean firms for the same international contract and the increasing demand in importing countries for higher level procurement ratios.

Korean firms are required to improve their knowledge of international markets, appreciate the significance of consortia bids and accept the need for greater interaction with consultant firms.

Finally, Korean firms should adopt management contracting, a technique which is particularly suitable for large and complex projects which require a complicated high technology.

12.3.2 RECOMMENDATIONS TO THE KOREAN GOVERNMENT

Policy recommendations to the Korean government are made with regard to: a) improving technological levels; b) modernising current labour-management relations; c) adjusting industrial structure; d) cultivating small and medium-sized enterprises; e) advances into overseas markets; f) improvements to the educational system; and g) the overall governmental support system.

Improving the Technological Level

The Korean government should pay more attention to technological innovation and recognise that, in the absence of labour cost advantages, comparative advantage is associated with a country's technological progress.

The ratio of R & D expenditure to GNP in Korea falls behind the developed countries, suggesting that Korea should continue to restructure its industry and move up the technological ladder to remain competitive in world trade.

The competitiveness of Korean firms has been adversely affected by the lack of design ability and technological manpower (Chapter 11). The Korean government should promote new technology to solve this disparity.

The following policy recommendations would contribute to improving the technological level of Korean plant and construction firms, inducing a more competitive performance:

(a) Improve inward technology transfer:

Policy makers should develop a support system for the diffusion of domestically developed technology and offer financial incentives to enterprises that adapt and improve introduced technologies.

(b) Cultivate specialist technical manpower:

The Korean Ministry of Trade and Industry should establish a training institute for sales engineers engaged in plant and construction exports to enhance the commercial skills of sales engineers. The Ministry should consider establishing a project management institute for project managers engaged in plant and construction exports to contribute to better project management through education and training, research and development and consultancy.

(c) Introduce advanced technologies:

Technological policy makers should pursue liberalised policies to remove controls on inward foreign direct investment, joint-ventures and licence agreements in order to improve the access of Korean firms to the leading edge of technology and innovation. They should encourage international joint research in the field of basic science and high technology to cope with technology protectionism in advanced countries.

Modernising Current Labour-Management Relations

Labour policy makers should establish the policies necessary for sound labour-management relations, recognising that the social cost of industrial unrest may rise substantially in the coming decade. The Ministry of Labour should: formally recognise the autonomy of democratic unions and guarantee free collective bargaining; intervene in cases of unfair labour practices; adopt a neutral and non-interventionist position in cases of industrial disputes; and set up facilities for leadership training and general employees' education on union matters.

Adjusting Industrial Structure

The Korean government should strengthen the banking sector in recognition of the fragility and immaturity of Korean capital markets.

The chairman of the Monetary Board should concurrently serve as a governor of the Bank of Korea to integrate the formulation and implementation of the nation's monetary and credit policies.

The industrial policy makers should reduce the level of government intervention and, instead, encourage the emergence of a private sector more responsive to market forces and entrepreneural decision making.

The Korean government should grant more power to the Fair Trade Committee at the Economic Planning Board to prevent excessive market concentration in a few business conglomerates. Institutional reforms are necessary to develop manufacturing industries and social overhead capital in rural areas.

Cultivating Small and Medium-sized Enterprises

The Ministry of Trade and Industry should take steps to enhance technical capabilities in small and medium-sized firms which are not yet responsive to government incentives.

Existing advisory committees, such as the Korean Federation of Small Businesses, should become pro-active rather than ceremonial in developing closer relationships within industry and between industry and government.

The government should pay more attention to the parallel development of large and small industries.

Advances into Overseas Markets

The Korea Institute for Economics and Technology, the Korea Trade Promotion Corporation (KOTRA) and the Korean embassies abroad should be pro-active in developing and maintaining up-to-date market information so that Korean firms can have enough time to prepare their tenders. The Overseas Construction Association of Korea and the Industrial Installation Export Association should publish statistical yearbooks relating to construction and plant exports respectively.

Korea is in an ideal position to provide South-East and South-West Asia with small and medium-sized plant on the most economic terms because Japanese firms have recently suffered from the continuous appreciation of yen, thereby weakening their price competitive power in this region. The Korean government should urge Korea's general trading companies now operating in the South-East and South-West Asia to expand their branch networks to create a better follow-up service, and encourage them to link up in joint-ventures. The Korean Society for the Advancement of the Machine Industry (KOSAMI) should search out small and medium-sized industrial plants which could be competitive in this region, while KOTRA should identify the specific equipment needs of Asian countries. In addition, the Korean government should assess the advantage of countertrade in the region.

The Korea government should develop its commercial relations with Japan. An International consortia between firms drawn from both countries, for example, would pool the resources of each countries and compensate their respective weaknesses (e.g. the appreciation of Japanese yen and the lack of technologies and experience in Korean firms). KOSAMI should draw up a standard agreement for international consortia for tender and execution of turnkey projects for use by Korean firms when forming consortia with non-Korean firms.

Improving the Educational System

Education policy makers are required to set up a clear long-run national strategy for an improvement in technical and vocational education. In the short-term, wage reviews could be used to remedy imbalances in the labour market and to influence the pattern of educational and occupational choices.

Overall Governmental Support Systems

The following policy recommendations focus on the various kinds of governmental support systems which would contribute to a more successful performance by Korean plant and construction firms.

(a) Expand the external economic cooperation fund and deferred-payment funds:

The Korean government should pay more attention to demands by importing countries for assistance with funding (i.e. suppliers' credit and deferred-payment terms), which is the most important incidental conditions typically requested. In effect, successful bidders usually state their intentions to grant suppliers' credit to service project financing for importing countries (Chapter 8). Hence, the Korean government should increase the external economic cooperation fund for this purpose.

(b) Improving the export insurance system:

Insurance is the most effective method of reducing the risk burden on transactions subjected to deferred-payment condition and soft-ware efficiency guarantees, as in the plant and construction industry.

The Ministry of Finance and the Export-Import Bank of Korea should improve the current export insurance system as follows: i) expanding insurance services by region and types of transaction acceptable; ii) reducing insurance rates; and iii) introducing a diversification of risks by adding private insurance company services to those offered by the Export-Import Bank of Korea.

(c) Across-the-board tariff cuts and tax relief for exporters:

With the across-the-board tariff cuts, the Korean government would sharpen Korean enterprises' international competitive edge, stablise domestic prices, increase consumers' welfare and ease trade frition with major trade partners.

(d) Simpler export procedures and better administrative support:

(e) Inducements to form international consortia and improve trade diplomacy.

12.4 CONCLUSIONS AND INDICATIONS FOR FURTHER RESEARCH

This section summarises the conclusions based on arguments and evidence developed in the preceding chapters with regard to: a) an analysis of success and failure among tenders, inculuing case histories of four contracts; b) risk management; c) contract strategy; and d) international competition. The section concludes with several indications for further research and development.

12.4.1 AN ANALYSIS OF SUCCESS AND FAILURE AMONG TENDERS

Our research, both field work and documentary scrutiny, has identified several important characteristics of and variables influencing the success or otherwise of Korean plant and construction firms in international markets.

Country and Industry Comparisons of Firm Size, Market Share, Firm Objectives and Major Export Regions:

It was found through the analysis of firm size that among Korean firms there is a need and considerable scope for increases in labour productivity and for a re-assessment of resource use as evidenced by relatively low sales volume per employee and under-capitalisation. Accordingly, these findings served to indicate that Korean plant and construction export firms should improve their labour productivity and use their issued share capital more effectively.

In comparisons of market share, firms with relatively large sales volume in the developed countries were found to sell their products more in their domestic market than in foreign market, while large-sized Korean firms appeared to be more dependent upon foreign markets and export performance than on the domestic market. Consequently, Korean firms are more vulnerable than their competitors to fluctuations in world demand.

In a comparison of firms' major export markets, both Korea and developed countries regard the Middle-East as an important export region, but developed country firms are more strongly represented. Elsewhere, Korean plant and construction firms show a stronger commitment to South-East and West Asian markets with small and medium-sized exports, and developed country firms to Africa, indicating that they have enjoyed location-specific advantages.

Plant exporters which, relative to construction firms, consider sales growth and labour productivity to be major objectives sell their products less in foreign markets than in the local markets, while construction firms generally sell their products more in foreign markets than in the local market. This pattern may be explained by the fact that plant firms are more capital intensive and less labour intensive and therefore less competitive internationlly than construction firms.

Success and Failure Factors Associated with Tenders

The research has shown that successful tendering for plant and construction exports can best be explained by the following five factors: (i) cooperation with importing countries (i.e. joint-ventures, mutually cooperative arrangements and consortia membership); (ii) the quality of bids (i.e. meeting delivery date, after-sales service, product quality and experience of the tender process); (iii) relationships with importing countries (close political and cultural ties); (iv) incidental conditions imposed by importing countries (e.g. demands for favourable and competitive credit terms and a commitment to high local procurement ratios); and (v) price competitiveness. All firms, in Korea and elsewhere, appeared to regard price competitiveness and an attractive bid package (e.g. technology, installation, construction and funds) as the most important success factors. In addition, Korean firms consider technological attributes to be important.

The reason for failed tenders for plant and construction exports can best be explained by the following four factors: (i) inadequate co-operation with importing countries via government and commercial channels; (ii) low quality of bids; (iii) weak commercial ties (no involvement in consortia bids or interaction with consultant firms); and (iv) price disadvantages. The study also found that all international plant and construction firms consider price disadvantages to be a greatly important factor in the failure of tenders or poor performance in both plant and construction exports, and poor after-sales service and a lack of traditional cultural link to be a relatively less important factor. Accordingly, price competitiveness or a lack of it is considered to be greatly important, respectively, for the success or failure of both Korean and non-Korean firms.

Successful tendering for Korean construction exports is explained best by: (i) quality of the bidder (a more supportive and sympathetic government policy and encouragement of new ventures directed towards exporting); (ii) increased oil prices during the 1970s; and (iii) low wages. Failed tendering by Korean construction exporters is explained best by: (i) technology competition, incidental conditions imposed by importing countries, and low quality of bidder; (ii) excessive competition between Korean firms; and (iii) unsuccessful market diversification and price disadvantages. Plant and construction firms in all countries consider Korean contractors' over-dependence on the Middle-East market to be a greatly important factor in the failure of Korean tenders for construction exports elsewhere.

Regression Models of Success and Failure of Tenders

It was found from the regression model that the high export volume (export success) of plant and construction exporters is more strongly influenced by mutual economic cooperation and number of employees than by sales volume and competent knowledge of plant and construction markets. It was also found that weak political and diplomatic relation between countries, low sales volume and lack of bid experience have an adverse effect and represent serious barriers to exports. The predictive power of the model is improved with the inclusion of the dummy variable. In other words, the industry effect (construction) cannot be ignored in explaining high export volume.

Case Histories of Four Contracts by Korean Firms

The research has identified various lessons which can be learned from the preconditions of success and failure which emerged from the case histories. The lessons are as follows:

- Reputation (e.g. meeting delivery date and product quality) and past record played a decisive role in winning bids;
- Continuous contact and negotiation with the client also played an im-

portant role in winning the bids;

- Top management support, consistent and effective senior management leadership and thorough initial study were all decisive success factors;
- The initial design, once agreed with the client, should be inviolate, except for unforeseen circumstances;
- In situations of technical uncertainty and complexity, the application of new appliances and simple construction methods can contribute to savings against the projected budget and to a shortening of the construction period;
- A disciplined approach to industrial relations must be exercised from the outset;
- There should be a thorough survey of the construction site;
- All risks (i.e. budget validity, political risk, etc.) should be assessed adequately;
- Designs should be appropriately developed and adequately tested before making a commitment to full-scale production;
- Avoid, if possible, a commitment to go-ahead with a project if the technology and design is in a preliminary or untested state;
- Design changes after production has begun is sometimes essential for commercial or other reasons, but must be undertaken with caution and under strict management control;
- There are extreme dangers in switching the design authority during different phases of the development;
- Inadequate design and project management procedures will lead to confusion and inefficiency;
- Where a careful pre-commitment appraisal with respect to major tech-

nological projects is not possible, budget projections should be targeted within a range of estimates rather than a single figure;

- It may sometimes be advantageous to change contract terms during the life of a contract;
- Fixed price contracting is clearly inappropriate in high risk situations. Where the risk is high, provision for cost recovery must be allowed for.

12.4.2 COUNTRY AND INDUSTRY COMPARISONS OF RISK MANAGEMENT

It was found that both Korean and non-Korean firms have experienced financial risk most and logistical risk least frequently, but Korean firms appeared to have experienced fewer logistical risk and more technical and financial risks than non-Korean firms.

Incomplete design and inadequate site investigation are regarded as the two most important sources of technical risk by the firms from both country groups. However, Korean firms were more concerned about technological factors and non-Korean firms about inadequate site investigation, reflecting the relatively low technological level in Korean firms.

Both country groups regard delay in payment as the most important source of financial risk and exchange rate fluctuations and inflation as the second and the third important sources, respectively. Both plant exporters and construction firms regard delays in payment as the most important source, but construction firms are far more strongly represented in this area.

Both Korean and non-Korean firms consider customs and import restrictions to be the most important source of political risk. This may be due to a reflection of protectionism in recent years. In addition, non-Korean firms regard war or revolution and the use of local firms and agents in importing country as much more important sources of political risk than do Korean firms.

Most Korean and non-Korean firms commonly rely on management perceptions to analyse political risks, and rarely use formal techniques such as the Monte Carlo principle or utility theory.

To remove or minimise unexpected cost and time overruns both Korean and non-Korean firms have most frequently resorted to risk reduction and risk transfer from client, contractor, sub-contractor or designer to insurer, inferring that the insurer plays an important role as a risk transferee.

It was found that Korean and non-Korean firms have most frequently resorted to the cost-reimbursable contract for avoidance or reduction of risks, but non-Korean firms are more strongly represented in this type of contract. This pattern is due to the features of the cost-reimbursable contract in which the client carries all the risk and thus pay for all the actual cost of construction.

Both Korean and non-Korean firms have most frequently experienced risks in the Middle-East, followed by South-East Asia and Africa, the regions where their exporting has mainly occurred. Korean firms are more strongly represented in the Middle-East (and non-Korean firms in South-East Asia and Africa), largely due to the concentration of their exports in these regions and to decreased oil prices in recent years.

12.4.3 COUNTRY AND INDUSTRY COMPARISONS OF CONTRACT STRATEGY

This sub-section summarises attitudinal differences between the country and the industry groups with respect to: a) organisational structures for design and construction; b) types of contract; c) the tendering process; and d) the incidental conditions of contract imposed by importing countries.

Organisational Structures for Design and Construction

In the management and execution of design and construction, both Korean and non-Korean firms are seen to favour the conventional method and the package deal or turnkey contract. However, the conventional method is more frequent among non-Korean firms and the package deal or turnkey contract among Korean firms. Plant exporters have mostly tendered successfully under a package deal or turnkey contract arrangement due to the higher technological content of their activities and construction firms under the conventional method.

Korean firms seldom utilise management contracting, a technique which is particularly suitable for large and complex projects, whereas non-Korean firms frequently utilise this method. The low utilisation by Korean firms may be due to their inability to bid successfully for large projects which require a complicated high technology as a result of their weak engineering and design ability.

Types of Contract

In overseas plant contracts Korean firms have most frequently selected the lump sum contract, which imposes a maximum incentive and risk contingency sum on the contractor in comparison to a cost-reimbursable or target cost contract, inferring that they may seriously underestimate contract risks to enable them to become the lowest bidder in lump sum contracts.

With regard to the types of contract preferred in overseas construction projects, the research has shown that both country groups favour the lump sum contract and disfavour the target cost contract. In addition, non-Korean firms appeared to have more frequently experienced the cost-reimbursable contract. In a comparison of the two industry groups, plant exporters have mostly associated with lump sum contracts and construction firms with both lump sum and admeasurement.

When assessing the type of contract according to: a) the ability to meet project objectives; b) contractor's incentives; c) client's flexibility; and d) contractor's risk allocation, non-Korean firms are generally seen to be more satisfied with whatever methods they use for contract evaluation. In particular, non-Korean firms express a much greater degree of satisfaction with their ability to meet their project objectives and Korean firms are fairly dissatisfied with contractor's risk allocation, implying that they probably pay insufficient attention to risk contingency fund estimates for inclusion in the tender price. Construction firms are much more satisfied with the contractor's incentive compared with plant exporters.

With regard to the risk contingency in a lump sum contract, non-Korean firms generally consider the risk contingency to be more significant than do Korean firms. Construction firms appear to be more aware of contract risks when computing their risk contingency fund compared with plant exporters.

It was found that in lump sum contracts non-Korean firms have more frequently experienced an adjustment of their contract price than have

Korean firms, suggesting that Korean firms should be more prepared to press for adjustments to the contract price whenever they suffer contract changes initiated by their client or a cost escalation in order not to incur losses after finishing their projects. Construction firms have more frequently adjusted the contract price than have plant exporters when a cost escalation in a lump sum contract has occurred.

Tendering Process

In tender preparation non-Korean firms have carried out more competent estimating work than Korean firms in support of their tenders. Non-Korean firms appear to be relatively more satisfied with the quality of the tender and contract document of their terms and presumably prepare more accurate and concise contract documents than Korean firms, including the clarification of areas of responsibility and the unambiguous allocation of risks.

Both Korean and non-Korean firms have most frequently experienced competitive tendering among the various tendering procedures, followed by negotiated tendering. Non-Korean firms have more frequently experienced considerable differences between their tender total and the final contract price, and also delays in payments due from clients than have Korean firms. This may be explained by the tendency of Korean firms to tender low bids.

Korean firms are generally satisfied with the duration of construction and the magnitude and timing of advance payments, but less satisfied with the expected pattern of payment for measured work and with the impact of price inflation.

Incidental Conditions of Contract Imposed by Importing Countries

The research has shown that in both country and industry groups the most frequently experienced incidental conditions of contract imposed by importing countries are requests for project financing to service the contract and for process management and technology guidance, indicating that such requests have significantly influenced successful bids by both Korean and non-Korean firms. As a result, such facilities constitute an important competitive strategy. Small and medium-sized Korean firms tend to be excluded from participation in large projects on account of their inability to meet such requests.

Plant exporters have more frequently experienced incidental conditions (in particular, requests for long-term after-sales service and for unreasonable deferred payment terms) than have construction firms.

Relationships between Variables Associated with Risk Management and Contract Strategy

The research has shown that the quality of tender and contract documents is significantly correlated with the following four variables: a) whether the bids are fully responsive to the tender documents; b) differences in the technical content of bids; c) client's flexibility to introduce changes not defined at the tender stage; and d) risk sharing between client and contractor with a fairly strong association.

The more Korean firms have been satisfied with the duration of construction of the contracts for which they have tendered the less frequently they have experienced technical risk in their contracts. And the more firms have been satisfied with the ability to meet project objectives in assessing their contracts the less frequently they have experienced technical risk.

It was found that there are fairly strong relationships between the types of risk and organisational structures for design and construction. These are as follows: a) the firms which have most frequently preferred the package deal or turnkey contract have experienced some degree of technical risk; b) the firms which have most frequently experienced financial risk have been biased towards fee contracting, the most appropriate method for coping with unforeseen contingencies and emergencies; and c) the firms which have quite frequently experienced political risk have most frequently selected the conventional approach.

12.4.4 INTERNATIONAL COMPETITION IN THE PLANT AND CONSTRUCTION INDUSTRY

This sub-section summarises the conclusions based on attitudinal differences (between the country and the industry groups) and investigation with respect to: a) estimates of the competitive power of Korean plant and construction exports; b) a comparison of the international competitive power of plant exports by "revealed" comparative advantage; and c) attitudes of plant exporters and construction firms towards the education system, technology transfer and competitive advantage.

Estimates of the Competitive Power of Korean Plant and Construction Exports

With regard to Korean international competitive power as estimated by Korean firms, Korean plant and construction firms appear to compete successfully against developed countries with respect to price and delivery but experience technological weakness.

The views held by non-Korean firms from developed countries were that the success of Korean firms has depended upon price and competent financial arrangements, and failure upon technology and inadequate finance, offering further evidence of the technological implications for Korean industry. Accordingly, non-Korean firms consider payment conditions to be an important factor in both successes and failures experienced by the Korean plant and construction export industries.

A Comparison of the International Competitive Power of Plant Exports by "Revealed" Comparative Advantage

In 1985 the United States appeared to have relative advantages in plant exports with respect to overall general plant, followed by the UK and Italy. On the whole, Italy and West Germany are at an advantage in the non-electrical machine group. In the case of electrical power machinery and switchgear products, Singapore leads in rotating electrical plant and switchgear products, but Hong Kong and France lead in electrical power machinery n.e.s. and electricity distributing machine, respectively. In telecommunication equipment products, Japan is at an advantage. Korea leads in the exportation of structures and parts for the iron and steel industry. This pattern of dispersed comparative advantage demonstrates the tendency towards intra-industry trade and specialisation.

Secialisation within commodity groups is also observable in regard to precision machinery in the developed countries and light electrical and telecommunication equipments in the NICs, indicating that: a) trade patterns are determined largely by inter-country differences in relative costs; b) differences in the level of technology are often considerably important; and c) labour costs greatly affect the determination of comparative advantage in the case of light electrical and telecommunication equipments. It was also found that the traditional gains derived from substituting cheaper imports for more expensive domestic merchandise are relevant in regard to simple and labour-intensive manufactures such as textile and leather machinery, electrical power machinery n.e.s. and structures and parts of iron and steel.

Attitudes of Plant and Construction Firms towards the Education System

The fact that non-Korean firms appear to have been supplied more adequately with qualified manpower by their education system than have Korean firms explains much of the weakness of Korean firms in technological factors such as design ability and quality. In Korea there has been an absence of clear long-run educational and employment policies.

Korean plant exporters and construction firms have suggested that, to increase its capability to supply adequate manpower, schools should be provided with more modern techniques and facilities and commit more resources to technical education.

In general, non-Korean firms are far more satisfied with the standard of recently graduated appointees employed by their firms compared with those of Korean firms. In particular, non-Korean firms are quite satisfied with their level of technical competence and academic knowledge relative to their recently appointed technicians.

Attitudes of Plant and Construction Firms towards Technology Transfer

Non-Korean firms have used a fairly sophisticated technology and

Korean firms a conventional or fairly unsophisticated one, pointing to the relatively weak competitive power of Korean firms in technological factors. This may be attributable to more active and strenuous efforts to upgrade the quality of products through the introduction of technology and in-house R & D investment in non-Korean firms compared with Korean firms.

On the whole, both Korean and non-Korean firms believe the technological level of Korean plant exporters in all the production phases to be inferior to that of developed countries.

Non-Korean firms have experienced more competitive situations in plant and construction markets than have Korean firms. This may be attributable to a more active export strategy by non-Korean firms to increase their sales and market share growth rates compared with Korean firms. Construction firms have experienced a slightly more competitive situation than have plant exporters.

Korean firms regard the direct purchase of technology patents as the most important method of technology transfer, followed by licence agreements. In contrast, non-Korean firms regard joint-ventures as the most important method and direct purchase of technology as the least important. This may be due to a sharp increase in the demand for core technology which Korea experiences as Korean industries become more sophisticated and their technological levels improve. Non-Korean firms may regard joint-ventures as the most important because this mode allows them to cope with tariff and non-tariff barriers from LDCs.

It was found that plant exporters consider direct purchase of technology patents to be the most important method of technology transfer, while construction firms favour joint-ventures. This may be because the plant industry is more heavily dependent than the construction industry on process management and skilled technicians and because the construction industry has been greatly suffered from competition from native firms in the Middle-East.

The US and Japan have been shown to be the leading suppliers of technology for the Korean plant and construction industry. In contrast, non-Korean firms consider West Germany, the US and the UK to be the three most important sources of technology and know-how. This may be attributed to psychic distance as well as the high level of technology in the case of the US. Plant exporters from Korea and other countries regard Japan as the most important source of technology and know-how, followed by the US, while construction firms favour the US, followed by the UK.

Attitudes of Plant and Construction Firms towards Competitive Advantage

Korean firms consider their two most important ownership advantages to be production management and their organisational marketing system. In contrast, non-Korean firms consider proprietary technology and product or process diversification to be their two most important ownership advantages. The most noticable feature in these comparison is the absence among Korean firms of proprietary technology as an ownership advantage.

Both Korean and non-Korean firms regard input prices, quality and productivity differentials as the most important location-specific advantage and psychic distance as one of the least important one attributed to Korean firms.

Korean firms have been more significantly influenced by general impediments to improving their international competitive power compared with non-Korean firms. In particular, the most influential impediment originates in the technological field. In contrast, non-Korean firms regard the inadequacy of a government support system rather than technological capability to be the most influential factor.

Both industry groups regard the lack of design ability and high technological manpower as the two most influential impediments.

Korean firms regard local manufacturers' direct sales force and lack of world demand as the two most significant economic impediments to obtaining their competitive advantage. In contrast, non-Korean firms consider lack of world demand to be the most significant one. Thus, it can be inferred that plant and construction firms in both country groups have significantly suffered from a lack of world demand in the world plant and construction markets.

Finally, the research has shown that both Korean and non-Korean firms consider preferential tax treatment, labour policies, or other operating rules and regulations benefiting local firms to be the most significant governmental impediment to their global competition.

12.4.5 INDICATIONS FOR FURTHER RESEARCH

Within this thesis the author has made several recommendations for further research and development. These are now summarised as follows:

(a) Further research orientated towards the behavioural sciences within the plant and construction industry may contribute to a better understanding of the differences between organisational structures and the circumstances appropriate for their use (Section 10.2.1).

(b) A study of the relationship between contractor (or sub-contractor) and insurer associated with transfer of risks.

(c) A study of the relationship between government manpower policies and the transfer of technology in the plant and construction industry.

(d) An evaluation of bids containing both quantifiable and qualitative variables for overseas plant and construction contracts.

(e) An analysis of the reasons why non-Korean firms from developed countries appeared to emphasise the importance of payment conditions and de-emphasise date of delivery in the analysis of the international competitive power of Korean plant exporters and construction firms.

(f) It would appear desirable to examine the stability of the RCA indices, and the relationship between the level of technological development and comparative advantage in plant exports.

(g) A comparison of the country groups (between Korea and developed countries) with respect to evaluation of bids with quantifiable variables for overseas plant and construction contracts (Section 10.2.3).

(h) A comparison of the country groups (between Korea and developed countries) regarding the types of contract associated with overseas plant contracts.

NOTES

1. The University of Manchester Institute of Science and Technology (UMIST) Project Management Group, which was founded in the Department of Civil and Structural Engineering in 1968, has become one of the UK's leading research, training and consultancy PM centres. The cornerstones of the UMIST Group's philosophy are: a) strong project management by and for the client; b) control based on foresighted decision making; c) innovations to reduce, and make manageable, risk and uncertainty; and d) to motivate good management through techniques which are effective and reliable in practice. The UMIST PM group uses Computer Aided Simulation for Project Appraisal and Review (CASPAR), which is a network program designed in-house at UMIST to model the interaction of <u>time</u>, <u>resources</u>, <u>cost</u> and <u>revenue</u> to aid the management of an investment project or contract. It may be used for feasibility studies, the compilation of an engineering estimate, and risk analysis.

2. The ratio of import liberalisation can be expressed as follows:

$$\frac{\text{(A) - (Prohibited and Restricted list)}}{\text{Total import trade (A)}} \times 100\ (\%)$$

3. <u>The Korean Trade Promotion Corporation (KOTRA)</u>, Kuala Lumpur International Symposium Final Report on Industrial Plant, Construction and Engineering, KOTRA materials 25-84, Seoul, Korea, November 1986.

4. Korean currency. US$ 1 equals about 700 Korean wons as of the end of October 1988.

5. In a tied loan the Japanese government directly finances the foreign government or corporation with long-term credit which is used to import equipment, technology and services from Japan.

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APPENDIX 1

February, 1987.

Dear Sir,

Questionnaire about Korean plant and construction exports

As you are aware, plant and construction exports from Korea have slumped continuously in recent years, and it is essential to identify the reasons for this and to suggest alternative strategies to improve performance

The questionnaire aims at finding out your and your firm's attitudes and opinions on the international competitiveness of Korea, and the problems that Korean firms face in exporting their products to foreign countries. Thus, the output of this questionnaire will probably contribute to an improvement in the international competitive power of the Korean plant manufacturing and construction industry.

The questionnaire represents a major part of my doctoral study in business administration, which is supported by the Korean Ministry of Defense and UMIST. Four main sections are included in this questionnaire: (1) factors influencing the success or failure of tenders for plant exports/overseas construction projects; (2) risk management; (3) elements of contracts; and (4) questions about the elements of competition in the industry.

All information divulged will remain strictly confidential. No individual data will be disclosed to any external body.

So, although this will take up some of your valuable free time, I urge you to help me in my research, which may contribute to an improvement in the performance of the plant and construction industry in Korea.

Finally, your co-operation and response would be highly appreciated. Thank you for your time and effort in helping me to complete this important research.

Yours sincerely,

Kyu Yeol LYU,
Lieutenant Colonel, Korean Army H.Q.
(Seconded as Doctoral candidate)
Department of Management Sciences.

PLANT AND CONSTRUCTION EXPORTS QUESTIONNAIRE

In answering the questions, please answer in the way that matters to yourself as a project manager or employer. A total of seventy questions are included in this questionnaire, which will take about one hour to complete.

PART ONE: FACTORS INFLUENCING THE SUCCESS OR FAILURE OF TENDERS FOR PLANT EXPORTS / OVERSEAS CONSTRUCTION PROJECTS

Please answer the questions with the information requested or by ticking the appropriate box.

1. a) **Name of the firm:** ....

   b) Export activity

      1) plant ☐
      2) overseas construction ☐
      3) both 1) and 2) ☐

   c) What is the nature of your firm's operation?

      1) industrial plant exports as a registered firm
      2) overseas construction company

   If you answered "c 1)", please go on to question "1 d)". If not, go to question 2.

   d) In which industrial sector is your firm represented? (Tick one).

      1) machinery manufacturing industry ☐
      2) general manufacturing industry ☐
      3) engineering ☐
      4) trade ☐

2. What is the size of your firm in terms of

   a) number of employees ....
   b) issued share capital (US$) ....
   c) sales volume in 1986 (US$) ....
   d) export volume in 1986 (US$) ....
   e) the ratio of R & D expenditure to sales (%) ....

3. For each of the objectives below, please tick the box which best represents their importance to your firm.

	Very important	Important	Of some importance	Of limited importance	Of no importance
a) gross profit	☐	☐	☐	☐	☐
b) profit growth	☐	☐	☐	☐	☐
c) return on investment	☐	☐	☐	☐	☐
d) sales growth	☐	☐	☐	☐	☐
e) market share	☐	☐	☐	☐	☐
f) market share growth	☐	☐	☐	☐	☐
g) capacity utilisation	☐	☐	☐	☐	☐
h) labour productivity	☐	☐	☐	☐	☐
i) other, please specify.					
1) competitiveness	☐	☐	☐	☐	☐
2) Mkt diversification	☐	☐	☐	☐	☐
3) introduction of High TECH	☐	☐	☐	☐	☐
4) accumulation of TECH	☐	☐	☐	☐	☐
5) the amount exported	☐	☐	☐	☐	☐

4. What is the distribution of the value of your annual output between the following markets?

	less than 20%	between 20% and 50%	between 50% and 70%	70% and over
a) local market	☐	☐	☐	☐
b) foreign market	☐	☐	☐	☐

5. Please indicate the significance to your firm of the major export regions as shown in the table below.

	Only market	The main but not sole market	The second most important market	The third most important market	The fourth most important market	The fifth most important market
a) U.S.A.	☐	☐	☐	☐	☐	☐
b) E E C	☐	☐	☐	☐	☐	☐
c) Mediterranean countries	☐	☐	☐	☐	☐	☐
d) Middle East	☐	☐	☐	☐	☐	☐
e) Newly Industrialised Countries (NICs)	☐	☐	☐	☐	☐	☐
f) Other, please specify.						
1) U.S.S.R.	☐	☐	☐	☐	☐	☐
2) Africa	☐	☐	☐	☐	☐	☐
3) South-East Asia	☐	☐	☐	☐	☐	☐
4) Pacific Rim	☐	☐	☐	☐	☐	☐
5) Latin America	☐	☐	☐	☐	☐	☐
6) Communist Block	☐	☐	☐	☐	☐	☐
7) Japan	☐	☐	☐	☐	☐	☐

6. For each of the possible factors, shown below, for <u>successful bids (tenders) in plant/construction exports</u>, if you feel the factor is extremely important, pick a number from the far left side of the scale and write in the box . If you feel it is extremely unimportant, pick a number from the far right, and if you feel the importance is between these extremes, pick a number from some place in the middle of the scale to show your opinion.

Extremely Important			Scale			Extremely Unimportant
1	2	3	4	5	6	7

<u>Success factors</u>

a) technological attributes ☐

b) competitive price ☐

c) attractive bid package (e.g. technology, installation, construction, funds) ☐

d) delivery date ☐

e) reputation and past record ☐

f) competent knowledge of the overseas plant and construction markets ☐

g) experience of tender process ☐

h) after-sales service ☐

i) competitive payment conditions ☐

j) high ratio of local (on-the-spot) procurement (manpower, installation, machinery and tools) ☐

k) close political and diplomatic relations between countries ☐

l) traditional cultural link ☐

m) mutual economic co-operation (trade, joint-ventures, loans and technology supply) ☐

n) mutual co-operative arrangements, with a consulting firm taking charge of feasibility study ☐

o) member of international consortium ☐

p) negotiating ability with foreign government officials ☐

q) quality guarantee of products exported ☐

r) fund arrangements ☐

7. In the same manner, give your opinions of the following possible reasons for <u>bid failure</u> in the plant and construction exports?

Extremely Important			Scale			Extremely Unimportant
1	2	3	4	5	6	7

a) price disadvantage ☐

b) low technology ☐

c) weak package (e.g. technology, installation, construction and funds) ☐

d) date of delivery ☐

e) poor reputation and past record ☐

f) inadequate knowledge of the overseas plant and construction markets ☐

g) lack of bid experience ☐

h) poor after-sales service ☐

i) unsatisfactory payment conditions ☐

j) excessive competition among native firms ☐

k) low ratio of local (on-the-spot) procurement (manpower, installation, machinery and tools) ☐

l) weak political and diplomatic relation between countries ☐

m) lack of traditional cultural link ☐

n) lack of mutual economic co-operation ☐

o) inadequate mutual co-operative relations with a consulting firm taking charge of feasibility study ☐

p) non-member of international consortium ☐

q) lack of negotiating ability with foreign government officials ☐

r) lack of guarantee of products exported ☐

s) inability to offer acceptable funding arrangements ☐

#8. <u>Korean general trading firms</u> have experienced many problems in the promotion of exports of plant and heavy-chemical products. Please score the importance of the problems listed below.

Extremely Important			Scale			Extremely Unimportant
1	2	3	4	5	6	7

a) The characteristics of management are dependent on the government and on hereditary ownership. ☐

b) the pursuit of rapid growth biased toward external performance in international market ☐

c) a management attitude which regards the neglect and sacrifice of small and medium-sized enterprises as inevitable ☐

d) inadequate staffing in foreign branch offices to fully develop overseas markets ☐

e) a lack of investment in education to cultivate plant (engineer) salesmen with talent ☐

f) a lack of long-term market development and marketing activities ☐

g) a weak commitment to long-term planning ☐

Note #: This question was surveyed only by the Korean plant and construction firms.

*9. <u>Plant engineering firms</u> have also experienced difficulties in penetrating export markets. Please score each of the following factors in the same manner.

Extremely Important	Scale	Extremely Unimportant
1 | 2 | 3 | 4 | 5 | 6 | 7		

a) Financial combines established plant engineering firms with short-term earnings objectives. ☐

b) a profusion of plant engineering firms resulting from minimum registration standards ☐

c) the small-scale nature of capital and technological projects ☐

d) excessive competition among native firms for orders for Korean domestic technological projects ☐

e) a lack of accumulated technology ☐

f) an inability of Korean firms to effectively collect information on foreign markets ☐

g) poor project management ☐

h) an inability to carry out feasibility studies and prepare basic design ☐

*10. There are many problems in <u>the lowest stratum of plant exports</u>. Give your opinions of the following reasons in the same manner.

Extremely Important	Scale	Extremely Unimportant
1 | 2 | 3 | 4 | 5 | 6 | 7		

a) unsatisfactory general information system (e.g. involved with procurement, analysis, interpretation, management, arrangement and storage of information for obtaining market trends, political, economic and cultural features and changes, development programmes and demand forecasts ☐

b) lack of sophisticated educational facilities ☐

c) a low level of heavy-chemical industrialisation (hardware) ☐

d) a low level of technology and R & D (software) ☐

11. Korea increased dramatically her overseas construction exports from 1979 until 1982. Score in terms of their importance of the reasons for this success given below.

Extremely Important	Scale	Extremely Unimportant
1 | 2 | 3 | 4 | 5 | 6 | 7		

a) low wages ☐

b) a supportive and sympathetic government ☐

c) an aptitude for new ventures ☐

d) increased oil prices during the 1970s ☐

e) others, please state;

1) active participation of overseas construction companies ☐

2) hard work and sincerity of Koreans ☐

3) technology accumulation ☐

4) policy of receiving orders with low price ☐

12. Since 1982, construction exports from Korea have slumped continuously. Please score in terms of their importance of the factors given below.

Extremely Important	Scale	Extremely Unimportant
1 | 2 | 3 | 4 | 5 | 6 | 7		

a) Korean contractors' over-dependence on the Middle-East market and a failure to diversify export markets ☐

b) growing competition for basic engineering from "low-wage" countries ☐

c) the emergence of counter-trading, e.g. payments with oil instead of cash ☐

d) low bids by some Korean business, which consequently resulted in default before contracts were completed ☐

e) the relatively high wage levels of Korean employees ☐

f) new global market trends moving towards technology competition and away from price competition ☐

g) a reputation for poor-quality construction in Korean firms ☐

h) excessive competitive bidding between rival Korean firms ☐

i) growth of exports on D/A (document against acceptance) and D/P (document against payment) and on deferred payments ☐

j) others:

1) importer's financial straits due to decreased oil prices ☐

2) inadequate project financing ability by Korean firms ☐

3) low technology level ☐

4) a trend moving towards construction by native firms ☐

5) inadequate investment for training sales engineers ☐

6) lack of marketing activities ☐

7) delay of introducing advanced technology ☐

8) lack of investment for technology development ☐

9) lack of project management ability ☐

Part Two: Risk management

Compared with home based contracts, overseas contracts generally produce a more extensive range of risks which often have a greater impact and probability of occurrence. In this section, we hope to evaluate the impact of risks upon strategy related to overseas plant and construction contracts.

13. Please rank the following risks your firm has experienced in overseas plant and construction contracts according to the order of frequency, with 1 as the most frequent, 2 as next in frequency, 3, 4 and so on. Mark 'X' against any which your firm has not experienced.

a) technical risk ☐

b) financial risk ☐

c) political risk ☐

d) logistical risk ☐

e) construction risk ☐

14. If your firm has experienced technical risk, please rank the following factors according to their relative importance, with 1 as the most important, 2 the next important, 3 the next and so on. Mark 'X' for factors of no importance.

a) incomplete design ☐

b) inadequate site investigation ☐

c) uncertainty over the source and availability of materials ☐

d) advanced/new technology ☐

e) need for standardisation of suppliers ☐

f) others (please write in and rank):

insufficient investigation of international law on anti-pollution ☐

15. If your firm has experienced financial risk, please rank the following factors according to their relative importance, with 1 as the most important, 2 the next important, 3 the next and so on. Mark 'X' for factors of no importance.

a) inflation ☐

b) availability of foreign exchange ☐

c) exchange rate fluctuations ☐

d) delay in payment ☐

e) repatriation of funds (profit) ☐

f) local taxes and royalties ☐

g) creditworthiness of contractors ☐

h) others, please specify.

1) insufficient financial ability of sub-contractors on the spot market ☐

2) reduction of project budget concerned ☐

16. If your firm has experienced political risk, please rank the following factors (as above) according to their relative importance.

a) war or revolution ☐

b) constraints on the availability and employment of expatriate staff ☐

c) customs and import restrictions and procedures ☐

d) use of local firms and agents ☐

e) regional differences in regulations ☐

17. If your firm has experienced logistical risk, please rank the following factors (as above) according to their relative importance.

a) embargo ☐

b) availability of resources-particularly construction plant, spares, fuel and labour ☐

c) availability of materials ☐

d) availability of expertise ☐

18. If your firm has experienced construction risk, please rank the following factors (as above) according to their relative importance.

a) productivity of resources/inappropriate plant ☐

b) weather and seasonal implications ☐

c) industrial relations ☐

d) new or different methods of construction ☐

e) suitability of materials ☐

19. Many risks and uncertainties are quantifiable in terms of their effects on cost or time or revenue. Such risks can be analysed by measuring their effects on the parameters used to assess project or contract viability (profitability indicators). Has your firm analysed any risks encountered in plant and construction contracts?

Yes ☐ No ☐ Don't know ☐

20. Which of the following techniques of risk analysis has your firm commonly used? (Tick the box as applicable).

a) sensitivity analysis ☐
b) probability analysis ☐
c) the Monte Carlo principle ☐
d) decision tree analysis ☐
e) utility theory ☐
f) management perceptions ☐

21. Any appropriate risk response can only be made following a thorough identification and analysis of risks. It is possible to consider the response to risks in terms of avoidance or reduction, transfer or retention. Please rank the following risk responses your firm has mostly applied to risk management according to the order of frequency, with 1 the most frequent, 2 the next and so on. Mark 'X' against any which your firm has not used.

a) avoidance ☐
b) reduction ☐
c) transfer ☐
d) retention ☐

22. Below are listed the four most common routes for the transfer of risk in construction contracts. Which of the following routes has your firm, as a contractor, usually applied to the transfer of risk?

a) client to contractor or designer ☐
b) contractor to sub-contractor ☐
c) client, contractor, sub-contractor or designer to insurer ☐
d) contractor or sub-contractor to surety ☐

23. In your opinion, which of the following types of contract are the most appropriate in order to avoid or reduce contract risks?

a) lump sum ☐
b) admeasurement ☐
c) cost-reimbursable ☐
d) target cost ☐

24. Please indicate in which region your firm has experienced risks in plant and construction exports. Rank in order of frequency, with 1 as the most frequent, 2 next in frequency and so on. Mark 'X' against any region which your firm has not experienced risks.

a) South-east Asia ☐
b) Middle-east ☐
c) Africa ☐
d) Europe ☐
e) North America ☐
f) Latin America ☐
g) Oceania ☐

Part Three: Elements of the Contract

This section includes questions which attempt to find out your views on certain aspects of contract related elements, such as tender appraisal, conditions of contract, contract strategy and cost structures in overseas plant and construction contracts.

25. The contractor should undertake sufficient detailed estimates to enable him to submit a tender which is commercially sound in terms of his own objectives but simultaneously meets the potentially conflicting objective of being competitive. Do you think that your firm carries out estimating work as above to submit such a tender?

Yes ☐ No ☐ Don't know ☐

If Yes: Please indicate the degree of competency with which your firm carried out the estimating work.

a) very adequately ☐
b) quite adequately ☐
c) quite inadequately ☐
d) very inadequately ☐
e) don't know ☐

26. Both tender and contract documents should be concise, unambiguous and give a clear picture of the division of responsibilities and legal obligations between the parties. Risks should be identified and clearly allocated. Could you please evaluate the quality of the tender and contract documents prepared for your firm in terms of the above mentioned factors? (Tick only one).

a) very satisfactory ☐
b) quite satisfactory ☐
c) quite unsatisfactory ☐
d) very unsatisfactory ☐
e) don't know ☐

27. There are several different tendering procedures available for selecting construction contractors. Which of the following tendering procedures has your firm experienced in overseas plant and construction contracts? Please rank according to the order of frequency, with 1 as the most frequent, 2 as next in frequency, 3, 4 and so on. Mark 'X' against any which your firm has not experienced.

a) competitive ☐
b) two stage ☐
c) negotiated ☐
d) continuity ☐
e) serial ☐
f) term ☐

28. Could you please evaluate the bids with financially explicit variables for overseas plant and construction contracts for which your firm has tendered in terms of the following factors? (Tick any applicable).

	Very Satisfactory	Quite Satisfactory	Neutral	Quite Unsatisfactory	Very Unsatisfactory	Don't know
a) whether the bids are fully responsive to the tender documents	☐	☐	☐	☐	☐	☐
b) correction of bid prices for arithmetical errors	☐	☐	☐	☐	☐	☐
c) differences in technical content	☐	☐	☐	☐	☐	☐
d) adequacy of resources and method of construction	☐	☐	☐	☐	☐	☐
e) major differences in timing of payments and in any advance and mobilisation payments	☐	☐	☐	☐	☐	☐
f) appreciation of the allocation and implications of risks	☐	☐	☐	☐	☐	☐
g) a price comparison	☐	☐	☐	☐	☐	☐

*29. Could you please evaluate the bids with quantifiable variables for overseas plant and construction contracts for which your firm has tendered in terms of the following quantifiable factors? (Tick any applicable).

	Very Satisfactory	Quite Satisfactory	Neutral	Quite Unsatisfactory	Very Unsatisfactory	Don't know
a) duration of construction	☐	☐	☐	☐	☐	☐
b) magnitude and timing of mobilisation and advance payments	☐	☐	☐	☐	☐	☐
c) expected patterns of payment for measured work	☐	☐	☐	☐	☐	☐
d) price inflation	☐	☐	☐	☐	☐	☐

*30. The choice of types of contract is one of the most central strategic decisions, since it governs the method by which the contractor will be paid and provides an overall statement of intent as to how the risks are allocated between the parties. Which of the following types of contract has your firm chosen or been selected for most often in overseas plant contracts so far? (Tick any applicable and rank in order of frequency, with 1 as the most frequent, 2 next in frequency and so on. Mark 'X' against any which your firm has not experienced).

a) lump sum ☐
b) admeasurement ☐
c) cost-reimbursable ☐
d) target cost ☐

31. Which of the following <u>types of contract</u> has your firm been associated with most often in the <u>overseas construction contracts</u> so far? Please rank according to the order of frequency as in the previous question.

a) lump sum ☐
b) admeasurement ☐
c) cost-reimbursable ☐
d) target cost ☐

32. Could you please <u>evaluate the type of contract</u> which your firm has selected in question 30 or 31 in terms of the following factors?

	Very Satisfactory	Quite Satisfactory	Neutral	Quite Unsatisfactory	Very Unsatisfactory	Don't know
a) the ability to meet project objectives	☐	☐	☐	☐	☐	☐
b) incentives	☐	☐	☐	☐	☐	☐
c) flexibility	☐	☐	☐	☐	☐	☐
d) risk allocation	☐	☐	☐	☐	☐	☐

33. For the contractor, a lump sum contract requires that he allows in his price for all risks imposed by the contract. How significant has <u>the risk contingency been in a lump sum contract</u>?

a) very significant ☐
b) quite significant ☐
c) neither significant nor insignificant ☐
d) quite insignificant ☐
e) very insignificant ☐
f) don't know ☐

34. Lump sum contract does not necessarily imply a fixed price - in particular, price may be adjusted for cost inflation. How often has your firm adjusted the contract price due to cost inflation in a lump sum contract?

a) always ☐
b) often ☐
c) sometimes ☐
d) seldom ☐
e) never ☐

*35. Korean construction companies have made use of low-cost labour from Sri Lanka, Malaysia, Thailand, the Philippines and elsewhere because Korean wage levels are relatively high. To what extent has your firm <u>employed labour from these countries</u>? Please indicate the ratio of employees from low-cost countries to total employees.

a) below 5% ☐
b) 5 to 15% ☐
c) 15 to 25% ☐
d) 25 to 35% ☐
e) 35 to 45% ☐
f) over 45% ☐

*36. If your firm has employed labour from low-cost countries, please evaluate their overall contribution with regard to cost and effectiveness such as wage payments, skill and behavioural attitudes compared with Korean employees? (Tick only one).

a) very satisfactory ☐
b) quite satisfactory ☐
c) quite unsatisfactory ☐
d) very unsatisfactory ☐
e) don't know ☐

37. There are many methods available to the project manager for the management and execution of design and construction. From which of the following methods has your firm mostly received orders for overseas plant and construction contracts? Please rank according to the order of frequency in your experience, with 1 as the most frequent, 2 as next in frequency, 3, 4 and so on. Mark 'X' against any method employed by the firm which an order has not been achieved.

a) conventional approach (divided management of design and construction) ☐
b) cost-reimbursable or target contract (co-operative management of design and construction) ☐
c) fee contracting (integrated management and construction) ☐
d) management contracting (separate management and construction) ☐
e) package deal or turnkey contract (integrated management of design and construction) ☐
f) direct labour force account (integrated management of design and construction) ☐

38. There are many incidental conditions imposed by importing countries. Which of the following incidental conditions has your firm experienced in overseas plant and construction contracts? Please rank according to the order of frequency in your experience, with 1 as the most frequent, 2 as next in frequency, 3, 4 and so on. Mark 'X' against any which your firm has not experienced.

a) requests for project financing (funds and loans) ☐
b) requests for process management and technology guidance ☐
c) requests for counter-trade ☐
d) requests for exports on unreasonable deferred-payment terms ☐
e) requests for long-term after sales service ☐
f) others (please write in and rank)
   1) requests for purchasing materials and employing manpower at the fixed rate on the spot market for native firms ☐
   2) request for guarantee on safe supply of raw materials ☐
   3) request for sub-contract at the fixed rate of contract value for native firms ☐

39. In your opinion, how much has each of these incidental conditions influenced the winning of orders by your firm for overseas plant and construction exports?

	highly influential	fairly influential	fairly uninfluential	most uninfluential	don't know
a) funds and loans	☐	☐	☐	☐	☐
b) process management and technology guidance	☐	☐	☐	☐	☐
c) counter-trade	☐	☐	☐	☐	☐
d) exports on unreasonable deferred-payment terms	☐	☐	☐	☐	☐
e) importing resources and unnecessary goods	☐	☐	☐	☐	☐
f) long-term after-sales service	☐	☐	☐	☐	☐
g) sub-contracts (at the fixed rate of contract value) for native firms	☐	☐	☐	☐	☐

Part Four: Questions about the elements of competition in the industry

This section includes questions which attempt to find out your views on various elements of competition, such as competitive strategy, technology strategy and global competitive advantage.

Δ40. Has your firm ever competed with the Korean plant and overseas construction firms to win orders before?

Yes ☐ No ☐ Don't know ☐

If Yes, please go on to question "40 a)". If No, go to question 41.

a) In which export activity has your firm competed with Korean firms?

1) plant ☐
2) overseas construction ☐
3) both 1) and 2) ☐

b) To what extent has your firm competed with Korean firms?

1) strong competitive ☐
2) competitive ☐
3) slightly competitive ☐
4) uncompetitive ☐
5) don't know ☐

Δ41. In your opinion, which of the following factors has influenced the winning of orders by Korean firms for overseas plant and construction exports? Pick a number somewhere in the scale for each factor which

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Note Δ: These questions were surveyed only by the plant and construction firms in the eleven other countries except Korea.

represents its level of influence.

Highly influential	Scale	Highly uninfluential
	1 | 2 | 3 | 4 | 5 | 6 | 7	

Success factors

a) price competitive ☐

b) technology attitudes ☐

c) competitive payment conditions ☐

d) delivery date ☐

e) after-sales service ☐

f) design ability ☐

g) competent knowledge of the overseas plant and construction markets ☐

h) good quality ☐

Δ42. In the same manner as above, please estimate the following factors which have influenced the failure of korean firms to win orders for overseas plant and construction exports.

Highly influential	Scale	Highly uninfluential
	1 | 2 | 3 | 4 | 5 | 6 | 7	

Failure factors

a) price disadvantage ☐

b) low technology attitudes ☐

c) unsatisfactory payment conditions ☐

d) delivery date ☐

e) poor after-sales service ☐

f) poor design ability ☐

g) inadequate knowledge of the overseas plant and construction markets ☐

h) poor quality ☐

Δ43. In general, international competitive power can be estimated by price and non-price competitive factors. Please estimate the Korean International competitive power in plant/construction exports compared with that of your country in terms of the following price and non-price factors. Pick a number from the far left side of the scale and write in the box if you feel the competitive power is extremely strong. If you feel it is extremely weak, pick a number from the far right, and if you feel the competitive power is between these extremes, pick a number from some place in the middle of the scale to show your opinion.

Extremely Strong	Scale	Extremely Weak
	1 | 2 | 3 | 4 | 5 | 6 | 7	

a) price ☐

b) technology ☐

c) payment conditions ☐

d) date of delivery ☐

e) after-sales service ☐

f) design ability ☐

g) information collection ability ☐

h) quality ☐

#44. In the same manner as above, please estimate the <u>Korean international competitive power</u> in plant and construction exports <u>compared with that of Japan</u> in terms of the following price and non-price factors.

	Extremely Strong			Scale			Extremely Weak
	1	2	3	4	5	6	7
a) price	☐						
b) technology	☐						
c) payment conditions	☐						
d) date of delivery	☐						
e) after-sales service	☐						
f) design ability	☐						
g) information collection ability	☐						
h) quality	☐						

#45. In the same manner as above, please estimate the <u>Korean competitive power compared with that of the U.S.A.</u> in terms of the following factors.

	Extremely Strong			Scale			Extremely Weak
	1	2	3	4	5	6	7
a) price	☐						
b) technology	☐						
c) payment conditions	☐						
d) date of delivery	☐						
e) after-sales service	☐						
f) design ability	☐						
g) information collection ability	☐						
h) quality	☐						

#46. In the same manner, please estimate the <u>Korean competitive power compared with that of West Germany</u> in terms of the following factors.

	Extremely Strong			Scale			Extremely Weak
	1	2	3	4	5	6	7
a) price	☐						
b) technology	☐						
c) payment conditions	☐						
d) date of delivery	☐						
e) after-sales service	☐						
f) design ability	☐						
g) information collection ability	☐						
h) quality	☐						

#47. In the same manner as above, please estimate the <u>Korean competitive power compared with that of the U.K.</u> in terms of the following factors.

	Extremely Strong			Scale			Extremely Weak
	1	2	3	4	5	6	7
a) price	☐						
b) technology	☐						
c) payment conditions	☐						
d) date of delivery	☐						
e) after-sales service	☐						
f) design ability	☐						
g) information collection ability	☐						
h) quality	☐						

#48. In the same manner, please estimate the <u>Korean competitive power compared with that of France</u> in terms of the following factors.

Extremely Strong — Scale — Extremely Weak

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

a) price ☐

b) technology ☐

c) payment conditions ☐

d) date of delivery ☐

e) after-sales service ☐

f) design ability ☐

g) information collection ability ☐

h) quality ☐

#49. In the same manner as above, please estimate the <u>Korean competitive power compared with that of Italy</u> in terms of the following factors.

Extremely Strong — Scale — Extremely Weak

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

a) price ☐

b) technology ☐

c) payment conditions ☐

d) date of delivery ☐

e) after-sales service ☐

f) design ability ☐

g) information collection ability ☐

h) quality ☐

#50. In the same manner, please estimate the <u>Korean competitive power compared with that of Taiwan</u> in terms of the following factors.

Extremely Strong — Scale — Extremely Weak

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

a) price ☐

b) technology ☐

c) payment conditions ☐

d) date of delivery ☐

e) after-sales service ☐

f) design ability ☐

g) information collection ability ☐

h) quality ☐

#51. In the same manner as above, please estimate the <u>Korean competitive power compared with that of Brazil</u> in terms of the following factors.

Extremely Strong — Scale — Extremely Weak

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

a) price ☐

b) technology ☐

c) payment conditions ☐

d) date of delivery ☐

e) after-sales service ☐

f) design ability ☐

g) information collection ability ☐

h) quality ☐

52. Could you please describe the level of technology used by your firm compared with developed countries? (Tick one).

- a) very sophisticated ☐
- b) fairly sophisticated ☐
- c) conventional ☐
- d) fairly unsophisticated ☐
- e) very unsophisticated ☐
- f) don't know ☐

53. In the same manner, please evaluate the impediments shown below according to their effect on the international competitive power of your firm.

Highly Influential	Scale	Highly Uninfluential
	1 | 2 | 3 | 4 | 5 | 6 | 7	

- a) low technology ☐
- b) insensitivity of spot market information ☐
- c) small scale of capital ☐
- d) lack of experience ☐
- e) lack of ability to win orders ☐
- f) inadequacy of government support system ☐
- g) lack of high technological manpower ☐
- h) lack of design ability ☐
- i) low standardisation and low quality of home-made machinery and supplies ☐

54. Please evaluate the technological level of industrial plant exports from Korea according to its degree of sophistication, compared with that of major advanced countries?

	The highest level	Similar level	Below standard	Initiation (early) phase	Don't know
a) Orders received	☐	☐	☐	☐	☐
1) sales ability	☐	☐	☐	☐	☐
2) information collection	☐	☐	☐	☐	☐
b) Engineering	☐	☐	☐	☐	☐
1) feasibility studies	☐	☐	☐	☐	☐
2) design ability	☐	☐	☐	☐	☐
3) consultancy	☐	☐	☐	☐	☐
4) specification	☐	☐	☐	☐	☐
c) Machinery production	☐	☐	☐	☐	☐
d) Parts production (Sub-contractors)	☐	☐	☐	☐	☐
e) Plant construction	☐	☐	☐	☐	☐

55. Given that there are <u>two main patterns of technology</u> (labour intensive technology and capital intensive technology), could you please tell us which one is mainly used by your firm and the degree of such use?

a) highly labour intensive ☐

b) fairly labour intensive ☐

c) balanced between labour and capital ☐

d) fairly capital intensive ☐

e) highly capital intensive ☐

f) can't say accurately ☐

56. To what extent is the <u>Korean education system</u> capable of providing adequately qualified people for your firm <u>in general</u> for all grades of staff?

a) very capable ☐

b) fairly capable ☐

c) fairly incapable ☐

d) very incapable ☐

e) don't know ☐

*57. <u>If it is very or fairly incapable</u>, for each of the possible reasons shown below, please pick a number between the two extremes which best represents your opinion according to their relative importance and write in the box.

Extremely Important — Scale — Extremely Unimportant

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

a) The Korean education system is too academically oriented. ☐

b) neglect of technical education and vocation training ☐

c) concentration on quantity rather than quality ☐

d) the absence of clear long-run educational planning ☐

e) the lack of integration between education policies and employment policies ☐

f) the absence of modern techniques and facilities ☐

g) alienation from society's real problems ☐

*58. For each of the possible measures, shown below, <u>to make the Korean education system more efficient</u>, please pick a number and write in the box in the same manner as above.

Extremely Important — Scale — Extremely Unimportant

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

a) providing schools, colleges and universities with modern techniques and facilities ☐

b) paying considerable attention to technical education rather than academic skills ☐

c) making use of the experience of other developed countries in the field of educational planning ☐

d) linking educational plans with labour market requirements ☐

e) encouraging students to enter technical institutes rather than academic ones ☐

f) introducing new courses that deal with the problems of society ☐

*59. Does the <u>Korean technical education system</u> satisfy the needs of plant and construction industry in general for an adequately qualified technical labour force?

a) highly ☐

b) fairly ☐

c) neither well or badly ☐

d) poorly ☐

e) not at all ☐

f) don't know ☐

*60. <u>If it does so poorly or not at all</u>, please rate the following reasons according to their importance and pick a number which best represents your opinion and write in the box.

Extremely Important	Scale					Extremely Unimportant
1	2	3	4	5	6	7

a) lack of technical facilities (e.g. equipment) in colleges and universities ☐

b) irrelevance of courses and teaching techniques since they do not cope with technological changes ☐

c) traditional social values which regard technical education as second class ☐

d) funds allocated to technical education are inadequate ☐

e) the absence of co-ordination between educational planners and decision makers in industry ☐

f) technical school, colleges and institutes are limited in number and so their output is insufficient ☐

g) teachers' qualifications are poor and do not enable them to impart skills and transmit knowledge required by the real world of industry ☐

h) the absence of a long-run strategy of technical and vocational education ☐

61. How relevant are <u>technical education programmes</u> to the general technological development and the level of technical competence in Korea generally?

a) highly relevant ☐

b) fairly relevant ☐

c) fairly irrelevant ☐

d) highly irrelevant ☐

e) don't know ☐

62. Please evaluate the standard of recently graduated employees in your firm working as technicians.

	Very Satisfactory	Quite Satisfactory	Neutral	Quite Unsatisfactory	Very Unsatisfactory	Don't know
a) technical competence	☐	☐	☐	☐	☐	☐
b) academic knowledge	☐	☐	☐	☐	☐	☐
c) originality	☐	☐	☐	☐	☐	☐
d) keeping work discipline	☐	☐	☐	☐	☐	☐
e) social integration	☐	☐	☐	☐	☐	☐
f) dealing with problems	☐	☐	☐	☐	☐	☐

63. Please describe the sector in which your firm operates.

a) In technology terms

1) standardised technology ☐

2) low technology ☐

3) intermediate technology ☐

4) advanced technology ☐

b) In terms of competition

1) strongly competitive ☐

2) competitive ☐

3) slightly competitive ☐

4) uncompetitive ☐

64. What method of technology transfer does your firm use in general?

	The only method used	The main but not sole method	The second in importance	The third in importance	The fourth in importance	The fifth in importance
a) import of capital goods	☐	☐	☐	☐	☐	☐
b) transfer of a complete package, including the initial investment, production technology, management-advertising knowledge	☐	☐	☐	☐	☐	☐
c) transfer of each one of the components in b) separately	☐	☐	☐	☐	☐	☐
d) direct purchase of technology patents, accompanied by the payment of royalties for a limited time period	☐	☐	☐	☐	☐	☐
e) joint-ventures	☐	☐	☐	☐	☐	☐
f) licence agreements	☐	☐	☐	☐	☐	☐
g) others, (write in and tick)						
1) employment of consultant	☐	☐	☐	☐	☐	☐
2) sub-contract from developed countries	☐	☐	☐	☐	☐	☐
3) part sub-contract in engineering and design	☐	☐	☐	☐	☐	☐
4) self development	☐	☐	☐	☐	☐	☐
5) establishing of engineering and construction offices in foreign countries	☐	☐	☐	☐	☐	☐

Δ65. Has your firm experienced a joint venture partnership with Korean firms for overseas plant and construction exports before?

Yes ☐ No ☐ Don't know ☐

If Yes, please evaluate their overall contribution with regard to technological and behavioural attitudes compared with other developing countries.

a) very satisfactory ☐

b) quite satisfactory ☐

c) quite unsatisfactory ☐

d) very unsatisfactory ☐

e) don't know ☐

66. What are the nationalities of your sources of technology and know-how in general?

	The only method used	The main but not sole source	The second in importance	The third in importance	The fourth in importance	The fifth in importance
a) U.S.A.	☐	☐	☐	☐	☐	☐
b) U.K.	☐	☐	☐	☐	☐	☐
c) West Germany	☐	☐	☐	☐	☐	☐
d) France	☐	☐	☐	☐	☐	☐
e) Japan	☐	☐	☐	☐	☐	☐
f) Other:						
1) Netherlands	☐	☐	☐	☐	☐	☐
2) Norway	☐	☐	☐	☐	☐	☐
3) Finland	☐	☐	☐	☐	☐	☐
4) Italy	☐	☐	☐	☐	☐	☐
5) Self-experiences from all parts of the world	☐	☐	☐	☐	☐	☐

67. What do you view as the ownership advantages of your firm vis-a-vis foreign firms? Please pick a number which best represents your opinion according to their relative importance and write in the box.

Extremely Important — Scale — Extremely Unimportant

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

a) product or process diversification ☐

b) ability to take advantage of division of labour and specification ☐

c) proprietary technology ☐

d) trade marks ☐

e) production management ☐

f) organisational, marketing systems ☐

g) exclusive or favoured access to inputs, e.g. labour, national resources, finance, information ☐

h) ability to obtain inputs on favoured terms (due e.g. to size) ☐

i) exclusive or favoured access to product markets ☐

j) government protection (e.g. control on market entry) ☐

68. What do you view as the <u>location-specific advantages</u> attributed to Korean firms vis-a-vis foreign firms? Please write a number which best represents your opinion in the same manner as above.

Extremely Important			Scale			Extremely Unimportant
1	2	3	4	5	6	7

a) spatial distribution of inputs and markets ☐

b) input prices, quality and productivity differentials, (e.g. labour, energy, materials, components, and semi-finished goods) ☐

c) transport and communication costs ☐

d) government intervention ☐

e) control on imports (including tariff barriers), tax rates, incentives, climate for investment, political stability ☐

f) infrastructure (commercial, legal, transportation) ☐

g) psychic distance (similarities in language, cultural, business, customs etc.) ☐

h) economies of R & D, production and marketing ☐

69. Please evaluate the <u>significance of economic impediments</u> to obtaining a competitive advantage compared with rival foreign firms and then write a number which best represents your opinion in the same manner as above.

Extremely Significant			Scale			Extremely Insignificant
1	2	3	4	5	6	7

a) transportation and storage costs ☐

b) differing product needs ☐

c) established distribution channels ☐

d) local manufacturer's direct sales force ☐

e) sensitivity to lead times (because of short fashion cycles, rapidly moving technology) ☐

f) complex segmentation within geographic markets ☐

g) lack of world demand ☐

70. Please rate the <u>significance of governmental impediments</u> to global competition and then write a number which best represents your opinion in the same manner as above.

Extremely Significant			Scale			Extremely Insignificant
1	2	3	4	5	6	7

a) tariffs and duties ☐

b) quotas ☐

c) preferential procurement from local firms by government and quasi-government entities ☐

d) governmental insistence on local R & D or requring locally produced components in the product ☐

e) preferential tax treatment, labour policies, or other operating rules and regultions benefiting local firms ☐

f) bribery laws, tax laws, or other policies by home governments that are disadvantageous to foreign firms ☐

Thank you for all the trouble you have taken in providing your information and ideas. It is highly appreciated.

K. Y. LYU

Name ....

Occupation ....

APPENDIX 2

EMBASSY OF THE REPUBLIC OF KOREA
4 PALACE GATE
LONDON W8 5NF

21 January 1986

To whom it may concern

It is a pleasure to recommend Mr Kyu-Yeol Lyu who is preparing for a PhD in "Internationalisation of Korean Industry; a Study of Performance of the Plant and Construction Industry" at Manchester University, England.

Although I have been able to supply him with a lot of information for his thesis, he is also expected to obtain information from businessmen of your country on the above mentioned topic.

I am sure that if he completes this thesis it will be very useful to the business field of your country. Therefore, it would be most appreciated if you could possibly assist him in regard to the above thesis.

Thank you in anticipation of any assistance you are able to offer in this matter.

Yours sincerely

S Y Lee
Commercial Attache
(Representative)

APPENDIX 3

THE 20 NON-KOREAN INTERNATIONAL CONTRACTORS SELECTED (AMONG THE TOP 160 FROM MAJOR EXPORTING COUNTRIES)

U.S.A. (5)

Brown & Root Inc.
Foster Wheeler Corp.
Morrison-Knudsen Corp.
The parsons Corp.
An Anonymous Co.

Japan (3)

Chiyoda Chemical Engrg. & Const. Co., Ltd.
Kajima Corp.
Nishimatsu Const. Co., Ltd.

Italy (3)

Italimpianti SpA
Saipem SpA
Snamprogetti SpA

West Germany (2)

Krupp-Polysius AG
Coutinho, Caro & Co. AG

United Kingdom (1)

Lilley Construction Ltd.

France (1)

DUMEZ

Belgium (1)

S.B.B.M. & Six Construct SA, Les Entreprises

Turkey (1)

Enka Construction & Industry Co., Ltd.

Sweden (1)

Skanska AB

Taiwan (1)

Ret-Ser Engineering Agency

Singapore (1)

Boskalis International BV

Source: Engineering News-Record, July 17, 1986

THE SELECTED 42 KOREAN INTERNATIONAL CONTRACTORS

Plant Exporters (23)

Daelim Engineering Co., Ltd.

Daewoo Corporation

Daewoo Engineering Co., Ltd.

Daewoo Heavy Industries, Ltd.

Daewoo Shipbuilding and Heavy Machinery Ltd.

Golden Bell Trading Co., Ltd.

Hyosung Corporation

Hyosung Industries Co., Ltd.

Hyundai Corporation (2)

Hyundai Engineering Co., Ltd.

Hyundai Heavy Industries, Ltd.

Kolon Engineering INC.

Kolon International Corp.

Kukje ICC Corporation

Kukje Machinery Co., Ltd.

Lotte Engrg. & Machinery MFG. Co., Ltd.

Lucky-Goldstar International Corp.

Lucky Engineering Co., Ltd.

Samsung Co., Ltd.

Samsung Shipbuilding and Heavy Industries Co., Ltd.

Ssangyong Corporation

Sunkyong Ltd.

Construction Firms (19)

Daelim Industrial Co., Ltd.

Daewoo Corporation

Dong Ah Const. Industrial Co. Ltd.

Dongsan Construction Co., Ltd.

Hanbo Construction Co., Ltd.

Hanil Development Co., Ltd.

Hyundai Engrg. & Constrn Co., Ltd.

Hyundai Industrial Co., Ltd.

Korea Heavy Industries and Construction Co., Ltd.

Kuk Dong Const. Co., Ltd.

Lucky Development Co., Ltd.

Miryung Construction Co., Ltd.

Poong Lim Industrial Co., Ltd.

Samsung Construction Co., Ltd.

Samwhan Corporation

Shinsung Corporation

Shinwha Engineering and Constrn Co., Ltd.

Ssangyong Construction Co., Ltd.

You One Construction Co., Ltd.