THE BUSINESS STRATEGY INNOVATIONS OF THE TOP DESIGN FIRMS IN GLOBAL DESIGN & ENGINEERING MARKET

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ABSTRACT: The dynamic nature of the A/E/C industry, rapidly changing global market environments, and lowest cost competitive bidding make it difficult to survive in global design markets. To understand the global design markets, a case study has been undertaken. The top 150 global design firms represented in the ENR (Engineering News Record) from 1995 to 2003 are classified into three groups for the case study. First group is the firms which advanced in rank from 1995. Second group is the firms which maintained its rank from 1994 until 2003. Third group is the firms which went down in rank from 1995 until 2003. However, finding key factors and changing business strategies of successful top design firms are the fundamental goals in this paper. After examinations of case studies, this paper concludes and suggests that professionalization, M&A strategies, patrons of the government, and academic support are needed to be successful in the global design & engineering industry.

Key words : Global Design Market, Top Design Firms, Business Strategy Innovations

1. INTRODUCTION

Global design market was led by the Middle East between 1970's and early 1980's, and by North America and Europe beginning in late 1980's. In the 1990's the Asian market has been expanding rapidly, yet due to financial crisis as well as economic recession in the mid 1990's, the market is currently stagnant in the mid 2000's.

After the 1990's, the inclination of advanced design firms[1] to utilize their respective nations' heavy industry firms and trading companies has been increasing, and it has been shown that not only turn key method but also project financing procurement method has been utilized[2].

This trend demonstrates that design business is changing into a comprehensive business demanding not only technology in respective areas, but also financing procurement functionality. Also, as projects increase in complexity and scale, the comprehensiveness and high-quality of engineering technology has been recognized as a competitive factor.

On the other hand, it has been assessed that Korean design firms are at a phase in which they are developing from mid-low technology to mid-high technology. Yet, in the global market, Korean firms are placed between US, European and Japanese firms which possess advanced technology and firms from China and other developing nations which possess price competitiveness, and this placement leads to ambiguity in Korean firms' essential competitive factors[3]. It has been determined that for domestic design firms to establish their independent market space in the global market, they can no longer use the strategy of price competitiveness such as China, but rather use the strategy of obtaining competitive factors which advanced firms possess.

For this end, understanding change of competition paradigm in the global design market is important. Also survival and growth strategy used by advanced design firms should be analyzed. However, related surveys or efforts are quite lacking in Korea.

In this regard, this study shall subject to analysis the global design market which has fluctuated significantly since 1994. By discovering strategic actions of respective design firms in response to an environment different from the past, this paper will provide path through which domestic design firms may survive and grow in the global design market. Major content and methodology of the study to fulfill this purpose are the following.

First, examine current state of domestic and global design markets through relevant domestic articles as well as ENR's "Top 200 International Design Firms". Secondly, in order to examine the survival and growth strategy of advanced design firms, analyze changes in business structure[4] of firms

[1] Firms participating in design industry may have traditional design area background, but there are may EC firms such as Bechtel that are also participating. In this study, we are designating firms which have business areas other than design and engineering as design firms.

[2] Lee, Young Hwan and Lee, Bok Nam, Changes in Global Construction Market Competition Paradigm and Suggestions, Construction Industry Trend, CERIK, 2003. 1, pp.7-8

[3] Currently, sales of Chinese design firms are slow, yet they have surpassed Korean firms since Also, number of Chinese firms in the "Top 200 Design Firms" announced by ENR(Engineering News Records) has surpassed number of Korean firms since 1999.

[4] Business strategy innovation is reformation of competitive business structure to promote competitiveness of the organization as a whole, and establishment of leading corporate environment in response to changing environment. Business strategy innovation includes business diversification, vertical integration, strategic partnership, merger and acquisition. This

using "Top 150 Global Design Firms" and "Top 200 International Design Firms" reported by ENR in 1995 and 2003 as subjects. Then, recent M&A trends of advanced design firms have been investigated through various articles, and based on the aforementioned analysis, business structure strategy of advanced design firms were reviewed comprehensively. Finally, this paper summarize the results of our study and present suggestive notions that domestic design firms may obtain as well as the limit of the study and follow-up studies.

2. CURRENT STATE OF DOMESTIC AND GLOBAL DESIGN MARKET

2.1 Domestic Design Market

The size of domestic design market had been around 1.5898 trillion wons in 1997, dropped to 1 trillion wons during the IMF financial crisis, rebounded to 1.7499 in 2001, recovering 1997 level. In 2002, the size was 2.3778 trillion wons which was a large increase. (Refer to Table 1)

Table 1. Design Market Share with Respect to the Korean Total Construction Market

(Unit: 100 million wons, %)

Year	Construction Total			Design			Weight
	Domestic	Foreign	Total(A)	Domestic	Foreign	Total(B)	(B/A)
1997	799,079	235,738	1,034,817	15,898	261	16,159	1.6
1998	478,914	48,842	527,756	10,313	113	10,427	2.0
1999	511,362	104,307	615,669	11,176	28	11,203	1.8
2000	601,522	68,418	669,940	14,734	107	14,842	2.2
2001	678,359	57,116	735,475	17,499	51	17,550	2.4
2002	831,000	72,702	903,702	23,778	20	23,798	2.6
2003	1,024,000	43,783	1,067,783	29,491	113	29,604	2.8

*Data: Construction Association of Korea, International Contractors Association of Korea, Korea Engineering and Consulting Association

The scale of contract amount of domestic firms in the global market is minuscule. Specifically, in 1997 it was 26.1 billon wons (20 cases) and in 2002, it was recorded to be 2 billion wons in 22 cases. In the number of cases, similar number was retained yet, in terms of sales, the figures plummeted to one tenth of 1997 level.

On the other hand, number of design firms has increased gradually regardless of the IMF financial crisis from 569 firms in 1997 to 1327 firms in 2002, which was a 233% increase from 1997 level. Average contract amount per firm has decreased significantly from 2.79 billion won in 1997 to 1.93 billion won in 2002. For the circumstances, domestic design industry has been a domestic demand oriented industry, and has not considered global market as an essential market. However, due to market opening and over competition amongst firms will inevitably lead to a limit in the domestic market. Thus, there is an absolute necessity for domestic design firms to restructure business structure strategy which is oriented toward increasing foreign sales.

study seeks to analyze such corporate level changes in strategy.

2.2 Global Design Market

Size of global design market has been examined through ENR's "Top 200 International Design Firms.' Using the year 2002 as a basis, 50.9 billion dollars which is 62.8% of the 32 billion dollar total has been acquired from domestic markets and 18.9 billion dollars which is 37.2% of the total has been from foreign markets. (Refer to Table 2)

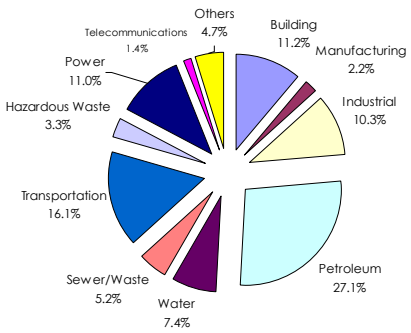
Table 2. Size of Global Construction Design Market

(Unit: Billion of US $, %)

Category	Domestic		Foreign		Total	
	Size	Increase over prev. year	Size	Increase over prev. year	Size	Increase over prev. year
Sales	32.0	+0.3	18.9	+7.4	50.9	+6.5
Weight	62.8		37.2		100.0	

Data:"The Top 200 Design Firms", 2003 Global Construction Source book, ENR, RS Means

Figure 1 shows each products in the global design market, petroleum has the largest market with 27.0% and transportation (16.1%), building (11.2%) and power (11.0%) follow.



Data:"The Top 200 Design Firms", 2003 Global Construction Source book, ENR, RS Means

Figure 1. Global Design Market Size for Respective Fields

The weights of foreign area in the global design market with respective to nationality and region are shown in table 3. Regarding nationality, 101 US firms which are roughly half of all 200 firms are included, and 56 European firms are included. Combined, these firms account for over 3/4 (157 firms) of the total number of firms. In sales, US firms account for 45.1 % and European firms account for 39.0 % which totals to 84.1% of the entire market. Regarding region, European market was the largest with 29.1%, Asian 23.4% and US 14.4$. These three markets account for two thirds of the entire market.

Table 3. Number of Firms per Nation and Market Distribution in the Global Construction Engineering Market

(Unit: Million of US$, %)

Nationality	# of Firms	Foreign Sales	Market						
			Middle East	Asia	Africa	Europe	USA	Canada	S. America
USA	101 (50.5)	8,500.0 (45.1)	534.9 (2.8)	2,202.1 (11.7)	435.9 (2.3)	3,020.0 (16.0)	-	710.1 (3.8)	866.3 (4.6)
CAN	10 (5.0)	1,717.1 (9.1)	90.0 (0.5)	235.9 (1.3)	215.4 (1.1)	152.7 (0.8)	910.0 (4.8)	-	113.0 (0.6)
EUR	56 (28.0)	7,349.2 (39.0)	679.4 (3.6)	1,477.1 (7.8)	457.5 (2.4)	2,261.3 (12.0)	1,660.7 (8.8)	417.2 (2.2)	395.0 (2.1)
UK	12 (6.0)	2,414.1 (12.8)	115.8 (0.6)	619.6 (3.3)	71.1 (0.4)	435.1 (2.3)	872.2 (4.6)	244.7 (1.3)	55.7 (0.3)
GER	8 (4.0)	378.4 (2.0)	57.3 (0.3)	185.1 (1.0)	57.3 (0.3)	41.9 (0.2)	8.2 (0.0)	-	28.6 (0.2)
FRA	7 (3.5)	1,251.3 (6.6)	246.3 (1.3)	216.2 (1.1)	139.9 (0.7)	406.3 (2.2)	105.2 (0.6)	27.9 (0.1)	109.5 (0.6)
ITA	3 (1.5)	145.5 (0.8)	41.7 (0.2)	22.3 (0.1)	4.1 (0.0)	52.1 (0.3)	-	-	25.3 (0.1)
NER	8 (4.0)	1,532.7 (8.1)	111.7 (0.6)	220.0 (1.2)	52.6 (0.3)	583.6 (3.1)	459.6 (2.4)	56.7 (0.3)	48.4 (0.3)
Other	18 (9.0)	1,627.1 (8.6)	106.6 (0.6)	213.9 (1.1)	132.5 (0.7)	742.4 (3.9)	215.5 (1.1)	87.8 (0.5)	127.5 (0.7)
JPN	11 (5.5)	542.3 (2.9)	88.4 (0.5)	308.9 (1.6)	32.4 (0.2)	18.8 (0.1)	12.6 (0.1)	-	81.2 (0.4)
CHN	8 (4.0)	150.3 (0.8)	70.0 (0.4)	56.6 (0.3)	14.7 (0.1)	4.4 (0.0)	1.9 (0.0)	-	2.6 (0.0)
Other	14 (7.0)	604.8 3.2)	203.6 (1.1)	138.7 (0.7)	72.8 (0.4)	36.3 (0.2)	103.8 (0.6)	0.3 (0.0)	22.2 (0.1)
Total	200 (100.0)	18,863.6 (100.0)	1,666.4 (8.8)	4,419.5 (23.4)	1,228.6 (6.5)	5,493.6 (29.1)	2,716.0 (14.4)	1,127.5 (6.0)	1,480.3 (7.8)

3. METHOD OF BUSINESS STRUCTURE ANALYSIS AND DESIGN FIRM SELECTION

3.1 Analysis Procedure and Method

Business strategy innovations of top design firms were analyzed in the following procedure and content. (Refer to Figure 2) First, for subjects of case analysis, this study chose firms that were included in both "Top 150 Global Design Firms" and "Top 200 International Design Firms" reported by ENR in 1995 and 2003. Then the firms were classified into three groups. Namely, those that had advanced in ranking (UP), those that had maintained their ranking (STAY), and those that had dropped in ranking. (DOWN)[5] Afterwards, using the aforementioned groups as subjects, we comprehensively reviewed changes in business structure of top design firms through the analysis of changes in business structure(product and market) between 1994 and 2002 as well as case studies of M&A between firms.

3.2 Selection of A/E firms.

Based upon the aforementioned criteria, 73 firms (48.7% of the 150 firms) were selected. It was discovered that using 1995 as the base year, more than half of top 150 design firms had dropped below 150th place in ranking, had been subject of M&A or had been weeded out.

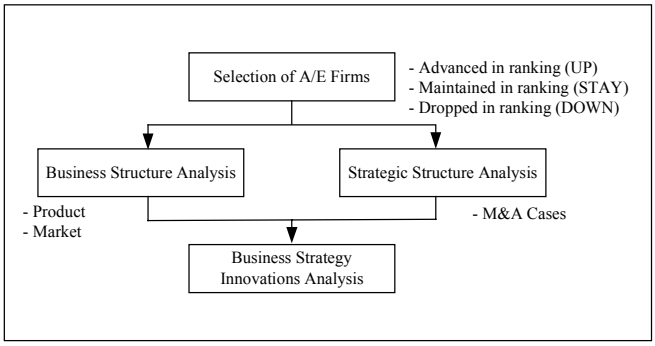


Figure 2. Procedure for analysis of Business Strategy Innovations

Firms that advanced in ranking (UP), those that maintained their ranking (STAY), and those that dropped in ranking (DOWN) are shown in Table 4. With 34 firms (53.4%) there was the highest number of firms which had advanced in ranking. Numbers of firms that maintained or dropped in ranking were 17 each (23.3%) and names of firms for respective groups are shown in table 5.

Table 4. Number of Firms Selected per Group

Category	Advance in Rank	Maintain Rank	Drop in Rank	Selected Firms
# of Firms	39	17	17	73
Ratio(%)	53.4	23.3	23.3	100

The aforementioned three groups have been created by comprehensively tracking the ranking of firms from 1995 to 2003. Firms which had fallen beyond 150th place, or which had not been top 150 firms were excluded from the selection due to difficulties in comparative analysis of their business structure and sales volume.

Table 5. Selected Firms for Each Group (Based on the year 1995)

'95 Rank	'03 Rank	Name of Firm	'95 Rank	'03 Rank	Name of Firm
Advanced in Rank(UP)					
68	1	URS Consultants(US)	8	2	SNC-Lavalin International(CAN)
26	3	Bechtel(US)	49	6	AECOM (US)
75	7	The Earth Technology (US)	33	8	WS Atkins (UK)
64	14	AMEC PLC, London (UK)	39	17	Foster Wheeler (US)
29	18	Montgomery watson (US)	130	19	Technip (FRA)
30	23	Mott Macdonald (UK)	34	24	OVE ARUP Partnership (UK)
57	29	Washington Group (US)	44	30	HNTB (US)
74	31	Pacific Consultant (JPN)	59	34	HDR (US)
87	44	CDI Engineering (US)	54	47	COWI Consult (DEN)
92	48	CARL BRO A/S (DEN)	63	49	Hellmuth, Obata & Kassabaum (US)
78	50	SIR William Halcrow & Partners (UK)	77	51	Snamprogetti (ITA)
126	53	TRC COS (US)	116	55	Burns & Mcdonnell (US)
123	56	Gensler (US)	80	58	Golder Associates(US)
89	65	Malcolm Pirnie (US)	81	66	Michael Baker (US)
108	67	Scott Wilson Kirkpatrick (UK)	119	68	STV (US)
102	71	Gannett Fleming (US)	129	72	Skidmore Owings & Merrill (US)
114	78	Dewberrry & Davis (US)	113	87	Brwon and Caldwell (US)
106	92	Kajima (JPN)	143	97	NBBJ (US)
147	114	Corrpro (US)	125	117	China Engineering Consultants (Taiwan)
134	123	A. Epstein & Sons International (US)			

[5] ENR's report of ranking is based on previous year's sales. Thus, rankings for 1995 and 2003 are based on sales from 1994 and 2002.

'95 Rank	'03 Rank	Name of Firm	'95 Rank	'03 Rank	Name of Firm
Maintained Rank (STAY)					
3	4	Fluor Daniel (US)	4	5	Jacobs Engineering (US)
9	9	CH2M Hill (US)	10	12	ABB Lummus Crest (US)
18	13	Fugro NV (NER)	13	16	Parsons Brinkerhoff (US)
19	20	Heidemij NV (NER)	23	22	Black & Veatch (US)
27	28	Camp Dresser & Mckee (US)	35	32	Louis Berger International (US)
40	38	DHV Beheer BV (NER)	47	42	Sargent & Lundy (US)
48	43	DAR AL-Handasah Consultants (Egypt)	42	46	ERM Group (US)
71	70	Systra-Sofretu-Sfrerail (FRA)	88	86	ENSR, Acton (US)
149	145	Connel Wagner (AUS)			
'95 Rank	**'03 Rank**	**Name of Firm**	**'95 Rank**	**'03 Rank**	**Name of Firm**
Dropped in Rank(DOWN)					
2	10	The Parsons (US)	6	26	Brown & Root (US)
14	25	The Shaw Group (US)	28	36	Jaakko Poyry Group (FIN)
12	37	Nikken Sekkei (JPN)	21	40	Tractebel Engineering (BEL)
16	52	Nippon Koei (JPN)	41	63	ROY F. Weston (US)
61	80	Burns and Roe Enterprises (US)	69	83	Professional Service Industries (US)
46	84	Nihon Suido Consultants (JPN)	62	93	Yachiyo Engineering (JPN)
43	111	Lahmeyer International GMBH(GER)	83	116	Fichtner Consulting Engineers (GER)
86	133	Day & Zimmermann International (US)	79	146	Kume Sekkei (JPN)
136	148	Bceom French Engineering Consultants (FRA)			

4. ANALYSIS OF BUSINESS STRATEGY INNOVATIONS OF TOP DESIGN FIRMS

4.1 Analysis of Business Structure

In this section this paper analyzes the changes in sales weight of products as well as changes in domestic and foreign sales to examine differences amongst different groups.

1) Group of firms which advanced in rank (UP)

Using 1995 as the base year, this group's domestic and foreign business weight as well as size of sales for each product is analyzed in figure 3 and 4.

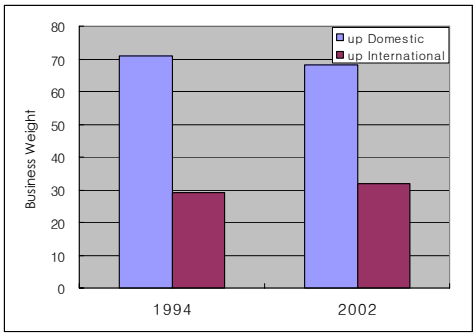


Figure 3. Weight of domestic and foreign sales for firms which have advanced in ranking

Total size of sales had increased significantly from 1995 to 2003 for those firms which had advanced in ranking. Firms in this group maintained 7:3 ratio between domestic sales and foreign sales in 1994 and 2002. This shows that firms included in this group had large domestic sales. Also, as shown in the total product distribution, weights of civil engineering construction which mainly deals with roads and port facilities, and general construction were high. Also, general industrial installations, petro-chemical plans and power generation plants also had significant weights. (Figure 4(A)). For further distinguish this distribution into domestic and foreign components, the weight of general construction and civil engineering construction in the area of transportation were heavy. Also, power plant, petroleum plant, waste disposal plant also maintained some weight of importance. (Figure 4(B)) On the other hand, in international markets, significant portion of sales was generated in the fields of general industry and petroleum. (Figure 4(C)).

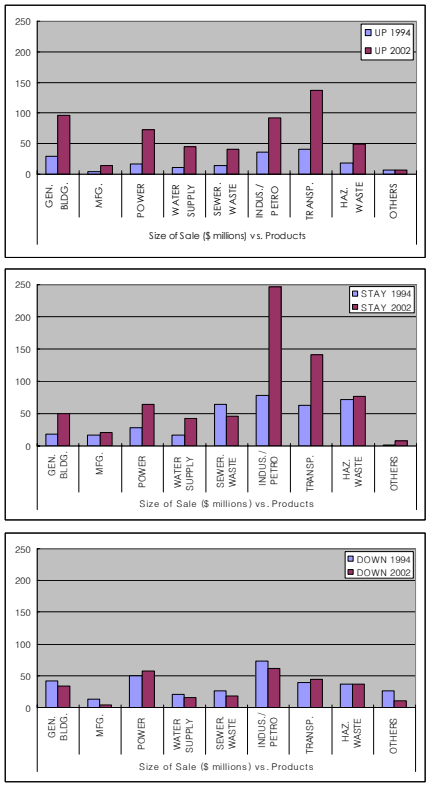


Figure 4. Comparison of sales of different products for firms which have advanced in ranking

In order to expand their businesses, the firms which advanced in ranking had promoted growth by building upon its key product as foundation and penetrated actively to other areas where market size was supportive. Also, to reduce the impact of domestic market circumstances, these firms maintained a certain level of foreign business scale (30%), and international markets are centered around a specialized product. (Petro-chemical area) Thus, in their domestic markets, these firms expanded to diverse areas depending on the changes in the market. Yet, in the international market they focus on specialized products which take their competitiveness into consideration[6].

2) Group of firms which maintained rank (STAY)

As seen in Table 5, using 1995 as the base year, there were 17 firms which retained their ranking 2003. With the

[6] Those firms which advanced in rank diversified their business and expanded their areas through M&A in response to civil engineering and construction market expansion in their respective nations.

exception of 1-3 firms, all these firms had been consistently placed within 40th place.

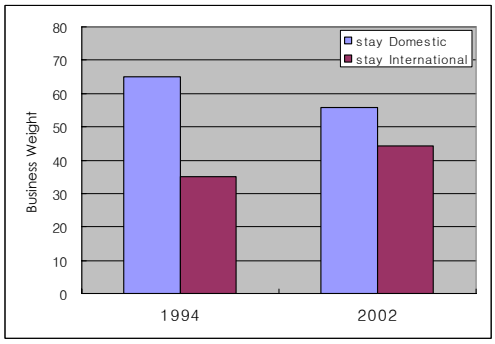
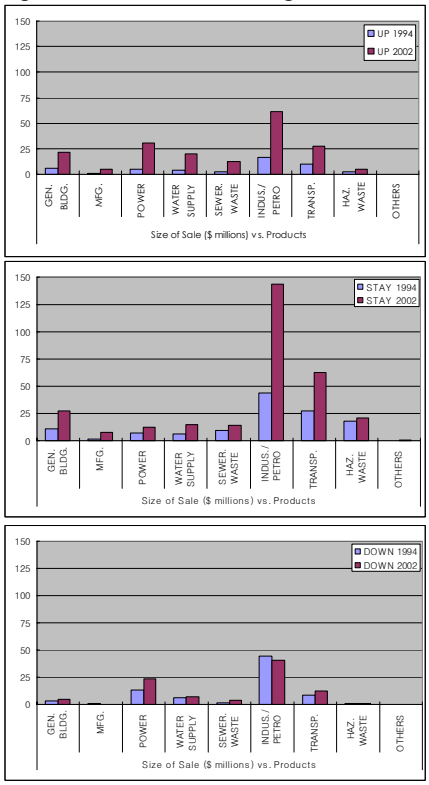


Figure 5. Weight of domestic and foreign sales for firms which maintained ranking

By examining the domestic and foreign business weight of these firms for respective years, the ratio of domestic and foreign business was around 6.4; 3.6 in 1994 and was 5.5:4.5 in 2003, showing a 10% increase of foreign business weight.(Figure 5). Specifically, domestic and foreign sales per each product can be seen in figure 6.



(A)

(B)

(C)

Figure 6. Comparison of sales of different products for firms which maintained ranking

In figure 6, with the exception of sewer waste treatment, the sales had increased significantly in all products. This trend was shown similarly in weights of products which account for domestic sales. However, in domestic sales, business weight was significant in the order of general industrial installations and petro-chemical installations, transportation area(civil engineering), hazardous material disposal and power generation areas. On the other hand, in foreign sales, with some share of transportation area, industrial installations, and petro-chemical installations areas accounted for most of the sales.

The most notable characteristic of the group of firms which retained their ranking is that they are not investing across all business areas, but are rather focusing on areas such as petrochemical and power generation where they have core competitiveness The firms which advanced in ranking diversified their business through M&A and promoted growth using the domestic market as a foundation. On the other hand, firms which maintained their ranking possessed competitive specialized products and maintained such competitiveness in the product market regardless of domestic or international markets.

3) Group of firms which dropped in rank (DOWN)

17 design firms which dropped in ranking were mainly firms with large domestic operations such as those in Japan (5 firms), Germany (2 firms), France, Finland, Belgium (a firm each), and mostly consisted of European firms. As seen in Figure 7, domestic to foreign sales ratio was 7.3:2.7 in 1994 and 6.8 to 3.2 in 2003 for this group of firms.

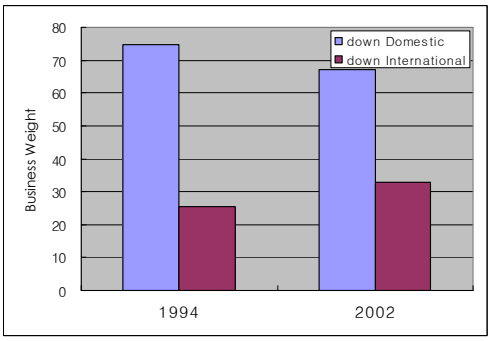


Figure 7. Weight of domestic and foreign sales for firms which dropped in ranking

To examine composition of sales for different products in figure 8, it is possible to see that the weights of sales were most significant for industrial installations, petrochemical and power generation areas. Transportation and general construction followed. (Figure 8(A)).

For examine figure 8(B), it is possible to see that sales had been decreasing across most product groups in domestic markets between 1995 and 2003. While the firms which advanced in rank increased their market share and expanded their business through diversification or M&A, firms which dropped in rank were not able to follow such strategic path.

This notion is further supported by decreasing sales in most product groups with the exception of power generation.

4.2 Case Study of Strategic Structure

There have not been significant changes in ranking for top firms in the design market such as SNC-Lavalin, Bechtel and Parsons. However, firms such as AMEC, The Shaw Group, and Washington Group have diversified their business through M&A and have used market expanding strategy to increase the scale of their businesses, leading to increase in sales.

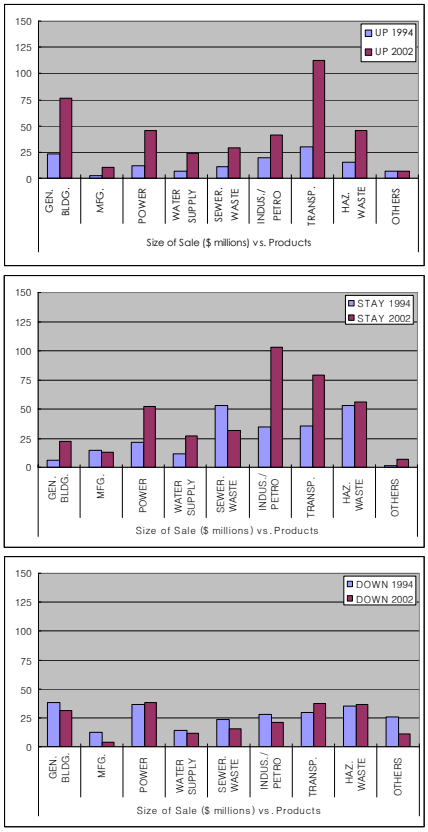


Figure 8. Comparison of sales for different products for firms which have dropped in ranking

As such, there are firms investing in business diversification. On the other hand, a leading firm in design area, Bechtel, is focusing not on all business areas, but rather on areas such as nuclear power in which the firm has core competitiveness. Firms with competitive edge are forming their M&A strategy for the purpose of diversification or specialization.

4.2.1 Representative case study of M&A for the purpose of business diversification

Technip-Coflexip, ranked 5th in 2003, had gained over 100 places in ranking since 1995, and was reputed to be a representative successful M&A case. This firm was formed by the merger of Technip and Coflexip, both French firms, in 2001. In January 1999, Technip acquired KTI which specializes in refinery, gas and petrochemical engineering, and Demag which possess strong competitiveness in manufacturing of energy and environmental installations. Through these acquisitions, Technip supplemented chemical area including ethylene, hydrogen and environmental area which was considered as its weakness. Also, it acquired Coflexip which was in undersea oil development business. Currently, the firm has over 20,000 employees in oil & gas industry and continues to expand its business areas[7].

[7] Han Yong Suk, Yim Kuk Il, "Strategic partnership and M&A for development of engineering industry" Korea Engineering and Consulting Association, 2001

AMEC in UK, ranked 14th in 2003 by "Top Global Design Firms," is an example of a fir which has used market diversification strategy centered around engineering. AMEC acquired AGRA, a Canadian construction firm, and maintained leading position in design market since 1999. AGRA was originally ranked 12th in design area of the global market, and its sales were 340 million dollars in 1998. In 1998, AGRA acquired Simmons which was ranked 29th in petrochemical plant area.

Washington Group, ranked 29th in 2003 by "Top Global Design Firms," is a representative firm which is growing consistently through M&A. It developed both its business area and depth through merger with Kasler in 1993 and acquisition of Morrison Knudsen in 1996. In 1999, it diversified its business through the acquisition of Westinghouse Electric. However, it has been discovered that there has not been significant increase in sales considering the size of the firm. In 2000, through the acquisition of Raytheon, ranked 22 in 1999, Washington Group positioned itself as a significant player in the plant market.

AECOM, a US firm, became a top ten global firm through M&A of Maunsell of UK, ranked 23rd in 2000. Until 1999, AECOM was a mid-size firm remaining in 98th place in global design market.

4.2.2 Representative case study of M&A for the purpose of business specialization.

In 1999, Siemens of Germany and Framatome of France consolidated their nuclear power businesses and acquired Duke of US shortly afterwards. The importance of nuclear power business and the power generation market size in the US were recognized. The purpose of the M&A was to develop nuclear power business.

In 1998, Kellogg and Brown & Root merged to form KBR(Kellogg, Brown & Root). This was the result of the merger of their parent groups, Halliburton and Dresser. Prior to the merger, Brown & Root, a design special firm, placed 3rd in global engineering market with 1.02 billion dollars of revenue in design area for the year 1997. M.W. Kellogg, which possessed specialty in construction of petrochemical and industrial factories, had 1.58 billion dollars of revenue in construction area, and was a large E&C (Engineering and Construction) firm ranked 25th in the world. The two firms, through merger, complemented each other's weaknesses, and KBR began to show prominence in sales. Moreover, the synergy of the strengths of the two firms is making entry into new areas a possibility.

A notable trend amongst A/E firms in advanced nations is that in order to strengthen the firm's competitiveness, restructuring efforts, including expansion of business scale and laying off of employees, are taking place. As a part of the survival strategy, curtailing of workforce is taking place in contracting markets. On the other hand, in expanding markets, international oligopoly or synergy effect are promoted through M&A. Also, M&A between global corporations is abolishing the concept of national boundaries,

transforming the concept of operating global construction firms from multi-national to transnational.

4.3 Comprehensive Analysis

Growth path of firms which have advanced or maintain rank can be easily determined if the selected firms are categorized into types based on domestic and foreign sales as shown in figure 9[8]. Basically, the growth path can be divided into the following five types.

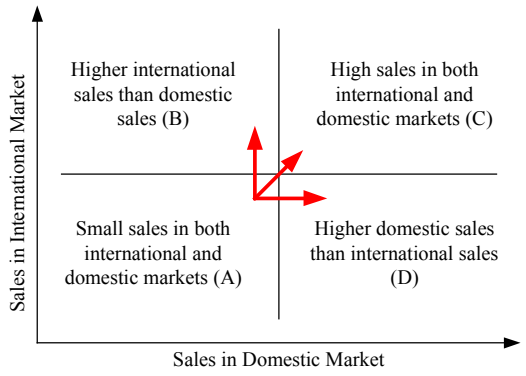


Figure 9. Firm's Types Through Domestic & International Market Share

(A)→(B): Firms that grow through entry into international markets rather than domestic markets
(A)→(D): Firms that capture domestic markets rather than international markets.
(A)→(C): Firms, based on pre-existing businesses, invest actively in both domestic and international markets
(D)→(C): Firms with various businesses domestically maintain growth and enter into international markets.
(B)→(C): Firms which used experience and technology acquired in international markets to capture domestic market.

As shown above, the growth path can be expressed differently for each firm depending on its specialization or characteristics. To enter international markets, a firm with strong foundation in domestic market may acquire another firm with strengths in international market through M&A. Likewise, such a firm may expand its business areas in the domestic market. Figure 10 is the actual depiction of the analysis in figure 9 showing the domestic sales and international sales matrix of the firms under study for 1995 and 2003.

It has been shown that those firms which advanced in or maintained rank followed growth path depicted as (A)→(D) or (A)→(B) pattern shown in figure 9. Using domestic market demand as a foundation, firms increased in size through product diversification or M&A. Also, using core products in the domestic market as foundation, firms could succeed in international markets.

[8] This Matrix can see the position of a firm at a specific point. But by including both the base point and comparison point it is possible to see the growth path of the concerned firm.

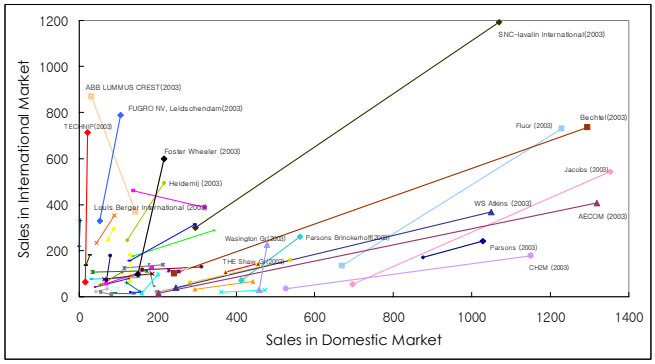


Figure 10. 1995 vs. 2003 Domestic and Foreign Market Sharing Matrix

Taking a closer look, among firms which grew in scale following the (A)→(D) path, those who advanced in rank were AECOM, Bechtel, The Shaw Group, SNC-lavalin International and WS Atkins. The characteristic of these firms is that they were consistently transforming through M&A and accomplished business diversification. Those firms which grew following. (A)→(B) path were already top ranking firms in global and engineering markets. Thus, the group of firms which maintained their ranking consistently includes firms which used their specialized product to enter international markets. Also, another characteristic of these firms is that they participated in the market not in the form of M&A but rather in the form of consortium through strategy partnerships. Representative firms include ABB Lummus Crest, Fugro NV, Heidermij NV, and Louis Berger International.

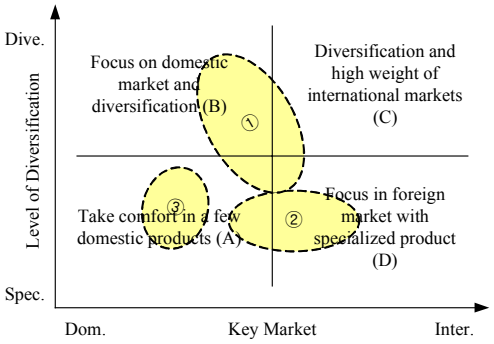


Figure 11. Selected Top Design Firms Group in the Key Market and Diversification Matrix

Figure 11 is the arrangement of analyzed top design firm cases using key market (domestic vs. foreign) and level of diversification (diversification vs. specialization) as criteria. Firms that advanced in rank(①) focused on M&A and product diversification in the domestic market; and also successfully entered international markets. Firms that retained their rank(②) gained experience in domestic markets through specialized products and entered international markets with specialized products. Finally, firms which dropped in rank(③) did not possess specialized products, took comfort in a few products in the domestic market, and did not actively seek entry into international

markets[9].

5. CONCLUSION

The purpose of this study is to determine success factors of firms which are responding appropriately to the rapidly changing environment of the global design market, and provide suggestion of future survival and growth for domestic design firms which have recently faced difficulties.

First, based on 1994, those firms which advanced in rank in 2003 sought product diversification based on domestic market demand rather than that of international market. Towards this end these firms actively utilized M&A strategies. Next, in order to maintain their positions, those top ranking firms in 1994 captured international markets actively using specialized products in plant area developed in domestic markets. They were able to retain their position in the market and in order to respond to trend of increasing complexity and scale, these firms expanded business size through strategic partnerships and M&A. From the result of the analysis, major suggestions that domestic design firms can acquire are the following.

From the growth paths of top design firms shown in figure 9, domestic design firms should pursue simultaneously the growth path of those firms which had dramatic advancement in ranking since 1994 (A→D) as well as the growth path of top ranking firms which maintained their position (A→B). The reason for such pursuit is that domestic engineering market small, having a mere 1% share of the global market, and product markets for specific products are not big enough to accumulate technology and experience in specific products. Moreover, with the exception of a few large engineering specialty firms, most large-size domestic design firms are linked to construction divisions of conglomerates. Rather than growing through intense competition in both domestic and foreign bids, these firms grew based on the demand of the associated conglomerate. Even specialized design firms have grown under partitioning protection institution of the current construction production system, and do not possess competitiveness in global market.

Considering such domestic circumstances, to promote survival and growth, domestic engineering firms should go through complete restructuring in order to cultivate technical capability through which they can nurture competitiveness. Also, the government should set the conditions for active nurturing and enlargement of engineering firms.

Lastly, this study has examined success and failure factors of subject design firms, mainly from ENR, through changes in business structures of products and markets using average data of groups. However, since each firm has distinct resources and strategies, the limit of this study should be supplemented by in-depth study of separate firms. Moreover, in order to distinguish firms according to each type and analyze the differences, a comprehensive follow-up study which not only includes changes in design market, but also those of construction contractor may be necessary.

[9] According to figure 11, there are 4 different types. Ideally, type (c) can respond rapidly to changes in the economy as well as changes in the market. However, there are not many firms belonging to this type.

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