The Effects of the Supplier Relations Strategy (SRS) on the Technical Capability of Suppliers (TCS): A Case of Korean Automobile Industry

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Ⅰ. Introduction

The supplier relations have become a primary concern as a source of the competitive edge in the automotive industry since Japanese automakers showed strong competitive power. Japanese automakers enjoy unique, effective supplier relations in their country and many non-Japanese automakers have begun to restructure their supplier relations since 1980's.

There has been a certain concensus that the competitiveness of an automobile assembler is not that of the company alone but that of the production network which comprises the automobile assembler and the whole suppliers (Shapiro, 1985, Dyer, 1994). Then the technical capability of parts suppliers which determine quality and costs of parts becomes very important. Especially, when the ratio of parts purchased from external suppliers is comparatively high like in Japan or Korea, the technical capability

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of supplier becomes much more important.

Nishiguchi (1989) argues that the supplier relations of a company come from the strategy of the company to its suppliers not from a specific culture. With this view, it is assumed that supplier relations are an aspect of the manufacturing strategy of an automobile assembler to gain the competitive edge of their production network. Especially, it is regarded that the technical capability of suppliers might be affected by the strategy of an automobile assembler.

The purpose of this paper is to confirm if there are positive relations between the supplier relations strategy (hereafter called SRS) of an assembler and the technical capability of its suppliers (hereafter called TCS) in the Korean automobile industry. This paper also tries to confirm that the supplier relations reflect not the specific culture of a country but the strategy of a company by showing that many companies pursue different SRSs even in the same country.

II. Supplier Relations Strategy (SRS)

When a firm procures necessary parts from outside suppliers, it may have two kinds of attitude toward suppliers. One is to squeeze suppliers to maximize bargaining power against the suppliers and the other is to trust and cooperate with the suppliers to obtain mutual benefits.

Helper (1987) divides previous researchers into two groups by their standpoints. She also classifies supplier relations into "Exit system" and "Voice system" using Hirschman's (1970) terminology. Similarly, Nishiguchi (1989) classifies supplier relations into "bargaing orientation" and "problem-solving orientation", and argues that supplier relations reflect a firm's strategy. According to Help's and Nishiguchi's ideas, this paper regards that supplier relations come from a firm's strategy and classifies SRS of an assembler into a continuum that ranges from bargaining-oriented strategy to problem-solving- oriented strategy.

An assembler with bargaining-oriented strategy tries to increase its bargaining power against the subcontractor. Its principal objective is to procure parts as low price as

possible using its dominant bargaining power. On the other hand, an assembler with problem-solving-oriented strategy regards suppliers as its business partners. It tries to enhance the supplier's technology to obtain better parts and to utilize better technical capability of the supplier in the long run.

Helper (1991) suggests that supplier relations have two dimensions: information exchange and commitment. Information exchange includes both the nature and mutuality of the information flow between supplier and customer. Commitment refers to the supplier's degree of conviction or assurance that the customer will continue to buy its products for some length of time. This paper uses Helper's idea again to analyze supplier relations on the plane of which the dimensions are information exchange and commitment.

Figure 1 classifies supplier relations strategies into four regions. The region represnting bargaining-oriented strategy lies near the origin, where both information exchange and commitment are low. The region representing problem-solving- oriented strategy is in the upper right corner, where both are high. The upper left corner is

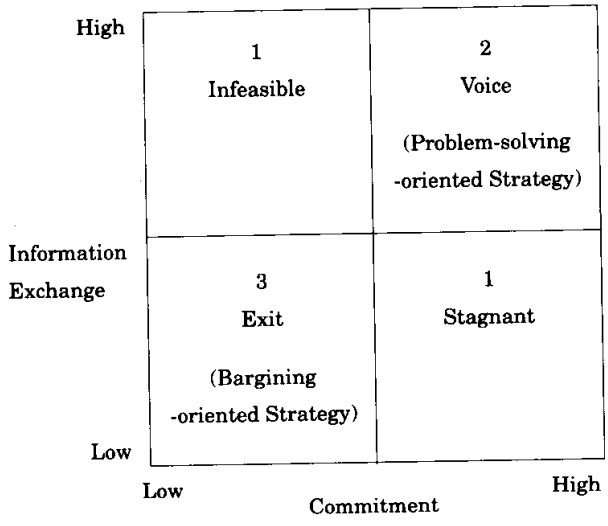

Figure 1. Dimensions of Supplier Relations Strategy

Source: Susan Helper, "How Much Really Changed between U.S. Automakers and their Suppliers?", *Sloan Management Review*, Summer 1991, p. 16

characterized by high information exchange and low commitment. This region depicts a transitional state to go to problem-solving-strategy region. In Korea, this study finds the situations that assemblers (customers) do not make commitment because suppliers' technical capability is low, but there are strong information exchange between assemblers and suppliers. The lower right corner is characterized by low information exchange and high commitment. The region is not desirable, but exists in Korea. Subsidiaries of an automaker or suppliers owned by the relatives of the automaker owner usually feel strong commitment. However they do not have much information exchange between the suppliers or subsidiaries and the automaker because of lack of cooperation between them.

This paper assumes that the more the strategy of an assembler lies on the problem-solving orientation, the more the assembler tries to increase commitment and information.

III. Technical Capability of a Supplier

The technical capability of a supplier determines the productivity of the company and the quality of parts that the supplier produces. The technical capability of a supplier can be classified into fabrication and assembly capability, production management capability, design capability, and development capability. Asanuma (1990) suggests that four technical capabilities are required for suppliers; the ability to develop products upon the specification of a customer and/or the ability to modify it, the ability to develop process upon the blueprint of a product and/or the ability to reduce costs using VE (Vlaue Engineering) technique, the ability to assure quality and/or to practice just-in-time delivery, and the ability to reduce cost using rationalization or VA (Value Analysis) technique.

The sources of technical capability are diverse, but this paper classifies them into two groups; internal development and external transfer. Internal development means product, process and management development by R & D activity of companies and external transfer means introducing technical knowledge or knowhow to the companies from the sources outside. The channels of external transfer are such as the transfer via purchasing

material and/or machinery, the technical assistance program by customer, the transfer via the exchange of information among companies in the same or similar industry, the transfer by scouting technician, licensing, learning from technological institute, etc. The external transfer of technology is especially important for the Korean suppliers who are mostly small and medium-sized companies usually lacking in R & D ability of their own.

Measuring a firm's technical capability is very difficult. This paper uses the productivity improvement capability and the quality improvement capability for representing the technical capability of suppliers, because they are two major variables that determine the competitiveness of products.

IV. Supplier Relations Strategy and Technical Capability of a Supplier

Shapiro (1985) argues that long-term trusting relationships between a customer and suppliers are the sources of cost reduction or product development. He asserts that vendor management policy of the assembler and various assistance to suppliers by this policy play an important role in the quality improvement of Japanese companies. Turnbull et al. (1992) argue that Japanese system of buyer-supplier relations allows greater technological diffusion between the vehicle assemblers and their suppliers in the Japanese automotive industry. Nishiguchi (1989) also argues that Japanese problem-solving-oriented SRS contributed to the technical improvement of suppliers by having them struggle on the cost reduction and quality improvement using various tools such as VE (value engineering), VA (value analysis), target cost, early involvement of part development, 'black box' design mechanism, grading, resident engineer system, etc. Helper (1987) also argues the impact of supplier relations on the technical change.

Hyundai Motor Company (HMC) in Korea has adopted various technical assistance programs to its suppliers to enhance their technical level since 1978. HMC reports the effects of these programs such as productivity improvement, inventory reduction, work space reduction, defect rate reduction, etc. Kia Motors in Korea also reports effectiveness of its various supplier assistance programs such as education and training assistance, information assistance, financial assistance, etc.

Regarding to the relations between the TCS and two dimensions of SRS, this study can infer as follows. The commitment decreases the uncertainty and increases the incentive of investment. So suppliers can increase the investment to the special-purpose facility and/or technology related investment such as licensing or R & D contributing to enhance the technical capability.

The information exchange contributes to the enhancement of technical capability of suppliers in two ways. They are the mutual information exchange and technical assistance program by the vehicle assembler. It is obvious that technical assistance promotes the technical capability of suppliers. The mutual information exchange is two ways. The information flow from suppliers makes the assembler understand and solve suppliers' problems. The information flow from the assembler makes suppliers prepare the policy change of the assembler in advance.

V. Methods

The argument presented above implies that the SRS of an automaker will have effects on the technical capability of its supplier. That is, the more the SRS of an automaker is in the problem-solving-oriented strategy, the higher will the technical capability of its suppliers be.

The basic test is whether the two aspects stated above are positively correlated. It does not intend to present causality, which will need more strict analysis.

This study performs four types of test. The first is to see whether the SRSs of Korean Big 3 automobile companies are different. The second is to see if an automaker applies different strategies of supplier relations to different suppliers. These two tests are to see whether supplier relations reflect specific culture in a country or a strategy of a firm. The third test examines whether the two dimensions of supplier relations are correlated with the technical capability of suppliers in terms of productivity and quality. The fourth test classifies all the respondents into four groups according to the supplier relations, and see what differences on the technical capability among these groups have. Final test examines what differences on the technical capability among the suppliers groups of

Korean Big 3 automakers.

VI. Data

1. Survey

The survey data were collected in summer 1995 under the sponsorship of the International Motor Vehicle Program at the Massachusetts Institute of Technology. Questionnaires were sent to 450 suppliers located in South Korea. These suppliers supply parts directly to the Korean Big 3 automobile makers; Hyundai Motor Company, Kia Motors Corporation, and Daewoo Motor Co., Ltd. The target respondents were the directors of marketing or strategic planning divisions at independent firms for Korean Big 3. These individuals were selected on the grounds that they would have broad knowledge on both customer rlationships and their firms' products and processes.

A sample was randomly selected from the list of first-tier suppliers of all automakers using the method of quota sampling. A total of 202 surveys were returned. The response rate was about 45%.

Because many companies supply their customers with several different types of products, and their relationships with their customers differ by product, respondents were asked to answer the survey for their most important customer regarding to a product that was typical of their companys' output.

2. Description of Variables

1) Commitment

The survey asks 8 questions to measure the level of commitment. They are

① the number of suppliers for a particular part, ② transaction period with the customer, ③ contract period, ④ prospect of supplier on the possibility of continuing transaction, ⑤ the method of pricing products, ⑥ the incentive to the improvement of product, ⑦ the assistance by the customer, and ⑧ the transfer of producing parts from customer's plant to the supplier's plant.

2) Information Flow

The survey asks 9 questions to measure the level of information exchange. They are ① the degree of suppliers' participation to the product development process, ② the degree of resident engineers' participation to the processes from product development stage to production stage, ③ the role of suppliers' association, ④ the degree of supplying diverse information of supplier to the customer, ⑤ the degree of supplying diverse customer information to the supplier, ⑥ technical, managerial assistance by the assembler, ⑦ the number of suggestions from suppliers to the assembler, ⑧ the degree of face-to-face communication between suppliers and the assembler, ⑨ the degree of using grading system, and ⑩ the degree to use non-price criterion when selecting supplier.

3) Productivity Improvement

It is defined that productivity is the man-hour required to produce a unit of product. The test measures the productivity improvement by the annual average rate of productivity change.

4) Quality Improvement

The test measures quality capability of a supplier by defect rate and the quality improvement by the annual average rate of the defect rate change.

VII. Results

The results of the statistical analysis are as follows:

First, Table 1 and Table 2 present one-way ANOVA of the commitment index and the information flow index by the Korean Big 3 automakers. The result confirms that Korean Big 3 automakers are significantly different in terms of the commitment and the information flow with the significance level of 1% respectively. Table 3 and Table 4 show the results of Scheffe's multiple comparison of the commitment and the information flow of Korean Big 3. The results show that company A and B are greater than C in terms of the commitment and the information flow with the significance level of 10% and 1% respectively. From these results, the study concludes that the SRSs of 3 companies are different. Especially, company A and B are much more different from C. From the

Table 1. One-way ANOVA of commitment index among automakers

		Anlysis of Variance		
Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	2	2.8626	1.4313	5.30	.0057
Within Groups	191	51.5489	0.2699		
Total	193	54.4114			

Table 2. One-way ANOVA of information flow index among autormakers

		Anlysis of Variance		
Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Between Groups	2	7.5001	3.7501	13.79	.0000
Within Groups	191	51.9562	0.2720		
Total	193	59.4564			

Table 3. Scheffe's multiple comparison of commitment index among automakers

		Index of Commitment	
Automaker	No. of Sample	(mean)	(s.d)
A	81	3.0601	0.4141
B	65	3.1553	0.5836
C	48	2.8375	0.5840
Total	194	3.0369	0.5310

Result of Multiple Comparison B, A > C (*)

*: Significance Level 10%

conclusion that supplier relations are different even in the same country, this study concludes that supplier relations reflect the strategy of an automotive company not the specific culture of a country.

Second, Table 5 represents the correlation anlysis between commitment, information flow and productivity improvement, quality improvement. By the results of the analysis, it can be concluded that 2 by 2 indices are positively correlated, which means supplier

Table 4. Scheffe's multiple comparison of information flow index among automakers

Automaker	No. of Sample	Index of Commitment (mean)	(s.d)
A	81	3.0403	0.4662
B	65	3.1693	0.5062
C	48	2.6573	0.6248
Total	194	2.9908	0.5550

Result of Multiple Comparison B, A > C (***)

***: Significance Level 1%

Table 5. Correlation Analysis between strategy (commitment and information flow) and technical capability(productivity improvement and quality improvement)

		productivity imp.	quality imp.
Commitment	cor. coeff.	0.2939	0.3675
	P-value	0.0000	0.0000
	# of Sample	186	186
Information Exchange	cor. coeff.	0.1762	0.2533
	P-value	0.0080	0.0000
	# of Sample	186	186

relations correlate with the technical capability.

Third, the test divides all respondents according to their commitment indices and information flow indices. That divides respondents into 4 groups with the above average or below average of each index. Table 6 shows the result of grouping the respondents. The test concludes that group I represents the group of bargaining-oriented strategy and group IV represents the group of problem-solving-oriented strategy. Table 7 and table 8 show the results of one-way ANOVA of productivity improvement and quality improvement among these groups. The results show that there are differences of productivity improvement and quality improvement among those 4 groups with the significance level of 10% and 1% respectively. Table 9 shows Scheffe's multiple comparison of productivity improvement and quality improvement. The result presents that the

Table 6. The result of grouping suppliers according to the SRS of automaker

Group III 28 Companies (15%)	Group IV 73 Companies (39%)
Group I 54 Companies (29%)	Group II 32 Companies (17%)

Table 7. One-way ANOVA of productivity improvement among strategy groups

		Anlysis of Variance			
Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob
Between Groups	3	0.0343	0.0114	2.20	.0900
Within Groups	183	0.3537	0.0052		
Total	186	0.0988			

Table 8. One-way ANOVA of quality improvement among strategy groups

		Anlysis of Variance			
Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob
Between Groups	3	0.8107	0.2702	2.80	.0008
Within Groups	183	8.5217	0.0466		
Total	186	9.3324			

productivity improvement and the quality improvement of group IV are much higher than those of group I.

Finally, table 10 and Table 11 show the results of one-way ANOVA of productivity improvement and quality improvement among the suppliers groups of Korean Big 3 automakers. The results show that the significant differences of these indices among suppliers groups with the significance level of 5% and 1% respectively. Table 12 shows Scheffe's multiple comparison of productivity improvement and quality improvement among those 3 groups. The outcome demonstrates that group B is significantly higher

Table 9. Scheffe's multiple comparison of productivity improvement and quality improvement among strategy groups

Strategy Group	No. of Sample	Productivity Imp. (mean)	Productivity Imp. (s.d)	Quality Imp. (mean)	Quality Imp. (s.d)
Group I	54	0.0511	0.0440	0.1552	0.1907
Group II	32	0.0605	0.0615	0.2670	0.2419
Group III	28	0.0651	0.0638	0.2241	0.2103
Group IV	73	0.0832	0.0931	0.3141	0.2232
Total	187	0.0763	0.0729	0.2467	0.2240

Result of Multiple Comparison IV > I (*) IV > I (***)

***: Significance Level 1% *: Significance Level 10%

Table 10. One-way ANOVA of productivity improvement among automaker suppliers groups

		Anlysis of Variance			
Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob
Between Groups	2	0.0439	0.0219	4.37	.0139
Within Groups	199	0.9981	0.0050		
Total	201	1.0420			

Table 11. One-way ANOVA of productivity improvement among automaker suppliers groups

		Anlysis of Variance			
Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob
Between Groups	2	0.6853	0.3426	7.11	.0010
Within Groups	199	9.5838	0.4820		
Total	201	10.2690			

than group A or group C in terms of productivity improvement with the significance level of 10%, and group A and group B is significantly higher than group C in terms of quality improvement with the significance level of 1%. The results confirm the differences of supplier relations strategies among the automakers. The fact that productivity

Table 12. Scheffe's multiple comparison of productivity improvement and quality improvement among automaker suppliers groups

Automaker	No. of Sample	Productivity Imp. (mean)	Productivity Imp. (s.d)	Quality Imp. (mean)	Quality Imp. (s.d)
A	54	0.0616	0.0783	0.2632	0.2347
B	32	0.0885	0.0721	0.3073	0.2237
C	28	0.0516	0.0518	0.1525	0.1808
Total	187	0.0679	0.0720	0.2511	0.2260

Result of Multiple Comparison B > A, C (*) B, A > I (***)

***: Significance Level 1% * : Significance Level 10

improvement and quality improvement are different among 3 suppliers groups shows that SRS is positively related with TCS.

VIII. Conclusions

This study proposed earlier that the supplier relations do not reflect a specific culture but the strategy of a company. The results of the test show that the supplier relations of Korean Big 3 automakers are different with each other even in the same culture. Thus, this study concludes that supplier relations reflect the strategy of a company.

The results lead the following conclusions:

The argument presented in the first part of this paper proposed that there were positive relations between the SRSs of automakers and the TCSs. The results of the test support the proposition. Our correlation anlysis between strategy indices and technical capability indices, one-way ANOVA of technical capability among strategy groups, and another one-way ANOVA of technical capability among automaker's suppliers groups confirm the above proposition.

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