

# A Survey Study of Quality Management Practices in Manufacturing and Service Sectors

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## Abstract

A questionnaire survey has been conducted to find out the total quality management practices in Korea. Its initial purpose is to search for some general measure of depth and width of spread of quality management throughout Korean industries, specifically in manufacturing and service sectors. This can be used as a guideline for supporting any activities endeavoring to find appropriate methods to boost quality management in Korea. Also, through comparisinal analysis at the macro-level, some characteristics in quality management practices are shown to exist in Korean industries. The analysis is based on perceptions of surveyed people about quality management practices in their companies.

## 1. Introduction

A questionnaire survey has been conducted to find out the total quality management practices in Korea. Its initial purpose is to search for some general measure of the depth and width of the spread of quality management(QM) throughout Korean industries. And the next is to use the data as a basic guideline for supporting any activities endeavoring to find appropriate methods to boost the quality movement in Korea. After reviewing the purposes, the author narrowed down the scope of the survey to answering the following three questions:

1. Does any difference exist with regard to QM practices between the manufacturing and the service industries?
2. Are any different behaviors distinct between the large and the small-to-medium(small) industries on their QM practices?
3. Are there any difference on QM practices between domestic companies and major international companies?

The above questions required some companies had to be chosen in each of the service and manufacturing industries and in each of the small-to-medium and large industries. Also for the question 3, foreign companies should be included.

Since it is a very difficult task to generalize the spread of quality management practices of companies in Korea within the survey time and budget, instead of relying on the number of respondents for the reliable analysis, an approach had been adopted, based on the concept of 2x2 factorial design with some replicates [Box, 1978]. From this design, a total of 9 companies are listed for the survey, 2 companies for each combination of the 2x2 cross classification table in addition to 1 multinational company. Also it has been decided that from each company at least 5 respondents would be required. Therefore 45 units of respondents are initially considered for the purposes. But since responses from 2 companies have been delayed by the time of analysis, the results from those two companies are not included in this report. These two companies are in the category of service industry, one from each of the small-to-medium and the large companies. Hence, a total of 7 companies are obtained as in <Figure 1>. The number in parenthesis shows the number of respondents in each company.

Product		6 Domestic		1 Multinational
		small	large	Size
Service	C(5)	G(4)		
	A(7)	E(5)	D(5)	
Manufacturing	B(8)	F(5)		

< Figure 1 > Surveyed companies

The classification between the service and the manufacturing industry is based on (1) whether the surveyed company has manufacturing facility and (2) whether the larger portion of the company income comes through the sale of its hardware products. The small and the large company depends on the number of its employees. If any company has more than 2,000 employees or it is a member of a Korean conglomerate, it is grouped as large. Domestic vs. multinational is based on the ownership of the company or the existence of a strong relationship with any foreign multinational company. To choose companies, personal contact has been made by referring to [4][5][12].

## 2. Questionnaire Structure

The questionnaire adopted from Hunt (1990) has been shortened from the original 215 number of questions to 73. The 73 questions were chosen based on the time taken on the Phase I Study(93/8-93/10) with 215 questions. It took more than 3 hours with the English version and many surveyed people faced a foreign language problem with the difficult level of language. Since not many people could find enough time for the whole questionnaire during their work hours, this difficulty arose and finally the new shortened version of the questionnaire has come out for the Phase II Study(93/12-94/8). Further, to lessen the language problem, the English version has been translated into Korean.

The questions are asking all aspects of practices, policies, procedures, and attitudes throughout the entire organization as they relate to quality enhancement. The questionnaire groups questions in the following four areas: Organization Climate(in short, Climate), Processes, Management Tools(in short Tools), and Outcomes. Each area is subdivided into smaller categories, which support each area in an analytical way. The area of Climate concerns people's perceptions about their organization and/or work units. It has subcategories composed of Strategic focus, Leadership and management, Work force, Customer orientation, and Communications. The Climate is composed of 30 questions. The Processes asks on organization's quality improvement policies, planning, practices, and procedures with 27 questions. In the Tools category, the questions are on the use of specific management techniques for promoting quality improvements and the category has 6 questions. Finally, in the category of the Outcomes, it focuses on mission accomplishment with 10 questions.

In this questionnaire three types of legends are used depending upon the questions asked:

- A : (1) strongly disagree, (2) disagree, (3) somewhat disagree, (4) somewhat agree, (5) agree, and (6) strongly agree.
- B : (1) almost none, (2) very few, (3) some, (4) quite a few, (5) most, and (6) almost all.
- C : yes, no, or not sure.

The questionnaire has some direct relations with categories and items in the Baldrige Quality Examination and also some correspondence with ISO 9000 [8][9].

### 3. Comparative Studies of QM Practices in Korean Industries

The questionnaire was distributed to each of the companies listed and scores were obtained. In this section, we try to find out what the scores reveal about the questions raised in section 1. First, we search for any different characteristics between the manufacturing and the service industry. Second, we compare the large vs. the small-to-medium industry. Third, the multinational company is compared with other domestic companies.

#### 3.1 Comparison Between Manufacturing And Service Industries

Traditionally in Korea the concept of quality management was introduced into the manufacturing sector three decades ago and its spread to the service industry has been slow [Whang, 1992]. It has only been in recent years that the importance of quality management in the service sector has been discussed openly in Korean society. But managers in the service industry already knew the importance of quality management to some degree and they have practiced it in their daily business. The first question in this survey is to identify any difference in quality management practices between the manufacturing and the service industries. The result obtained from the analysis of scores shows a failure to identify any difference between those two types of industries.

We can group Company C and Company G as in a service industry, while Company A, Company B, Company E, Company F as in manufacturing industry as shown in (Figure 1). The mean averages for the service and the manufacturing industry are calculated for each of the categories as in (Table 1). While the mean for the manufacturing industry has the higher average score in the Climate category, the service industry has scored more in the other three categories. However, since the difference between two mean scores in each category does not look significantly different, a statistical *t*-test has been adopted. Alternatively, we can use an analysis of variance table for testing our hypothesis. (Table 2) shows the difference of two means between the service and the manufacturing industry is not significant at the level of 10% in each of the categories. Therefore, based on information given in this survey, we can not see any statistically significant difference in means between the service and the manufacturing industry.

#### 3.2 Comparison Between Large And Small Industries

The second question is to compare the quality management practices conducted in the large and in the small-to-medium industries. (Figure 2(a)) shows the

〈 Table 1 〉 Means of service and manufacturing industries

industry	category			
	Climate	Processes	Tools	Outcomes
Service	4.16	2.52	1.47	4.14
Manufacturing	4.28	2.41	1.43	3.87
difference	-0.12	0.11	0.04	0.27

〈 Table 2 〉 Test on mean differences between service and manufacturing industries

I. Climate			II. Processes		
Service	Manufacturing		Service	Manufacturing	
3.96	3.88	4.51	2.05	2.24	2.76
4.35	4.24	4.46	2.99	2.04	2.66
$T=0.575 < t(0.1, 4)=1.533$			$T=0.316 < t(0.1, 4)=1.533$		
III. Tools			IV. Outcomes		
Service	Manufacturing		Service	Manufacturing	
1.10	1.40	1.90	3.62	3.39	4.32
1.83	1.08	1.33	4.65	3.93	3.84
$T=0.137 < t(0.1, 4)=1.533$			$T=0.795 < t(0.1, 4)=1.533$		

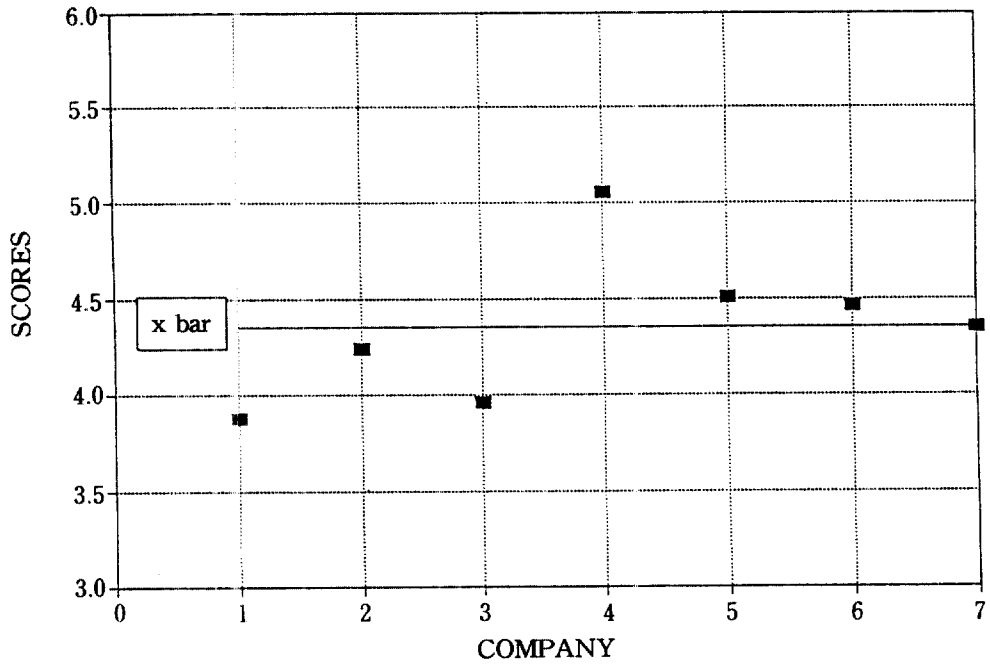
$T$  value is obtained as follows [Box, 1978]:

$$s^2 = [\sum (y_s - \bar{y}_s)^2 + \sum (y_M - \bar{y}_M)^2] / (n_s + n_M - 2)$$

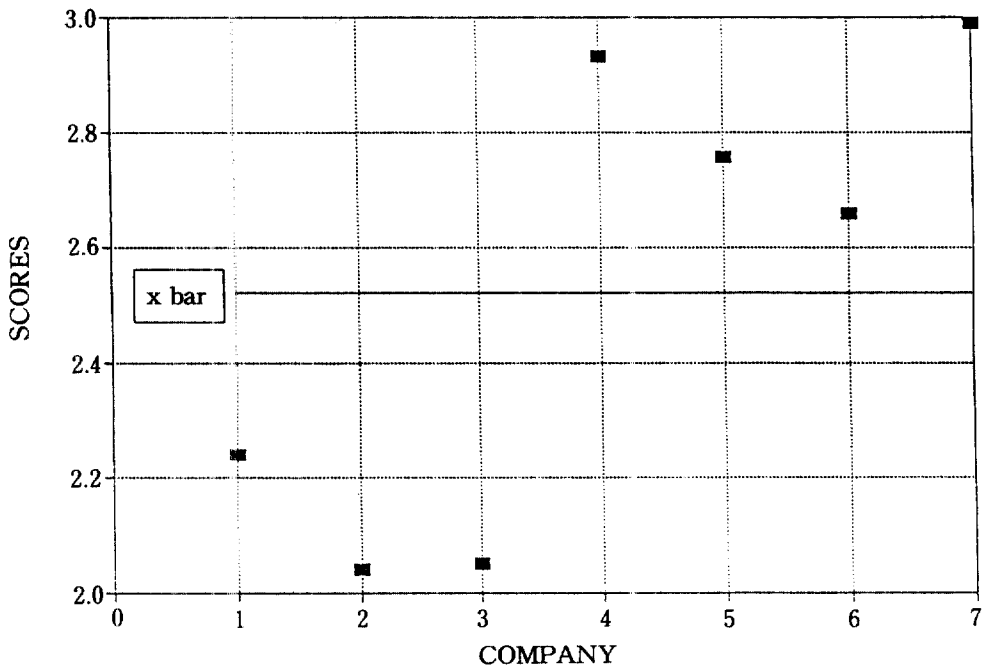
$$T = (\bar{y}_s - \bar{y}_M) / \{s(1/n_s + 1/n_M)^{1/2}\}$$

$t(\alpha, v)$  is the  $100(1-\alpha)$  percentile of  $t$  distribution with  $v$  degrees of freedom.

average scores of Climate obtained by each company, numbered from 1 to 7 for the companies Company A, Company B, Company C, Company D, Company E, Company F, Company G, respectively. All the scores have been recorded more than the target score of Climate 3.5. This may imply that most of the surveyed people recognize or perceive more or less the importance of quality and something is talking around about quality in their companies. That is, this score may express the degree of general perception on quality. From 〈Figure 2(a)〉, we can clearly notice that the first 3 companies have scores below the average Climate score line ( $\bar{x}$ ), while the remaining 4 companies have scores more than the  $\bar{x}$  bar line. The first 3 companies constitute the small-to-medium sized industry and

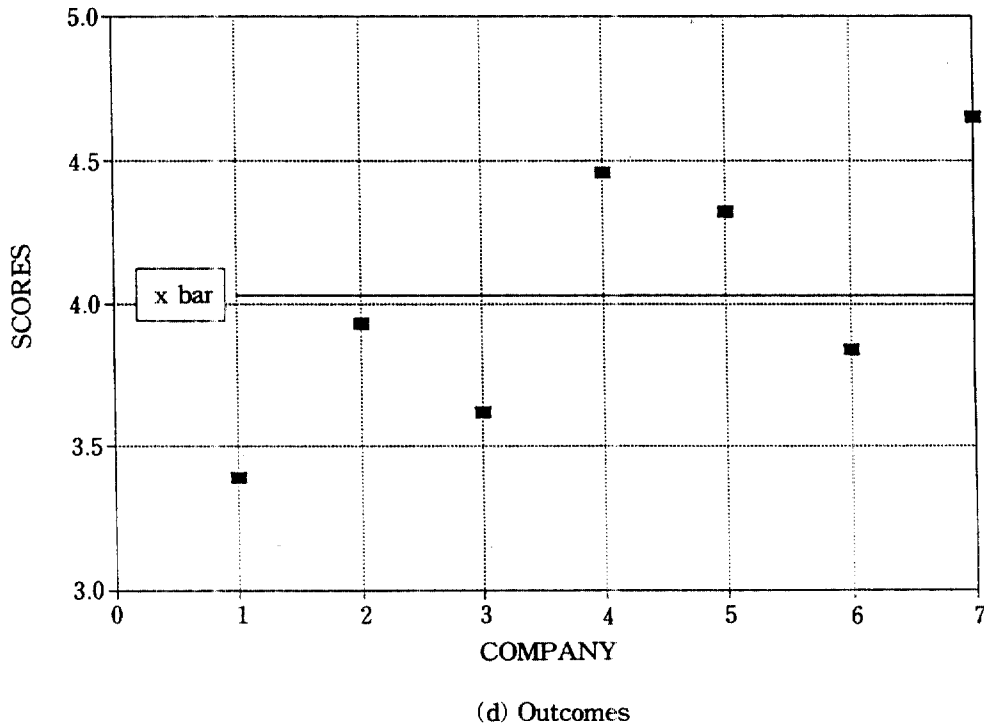
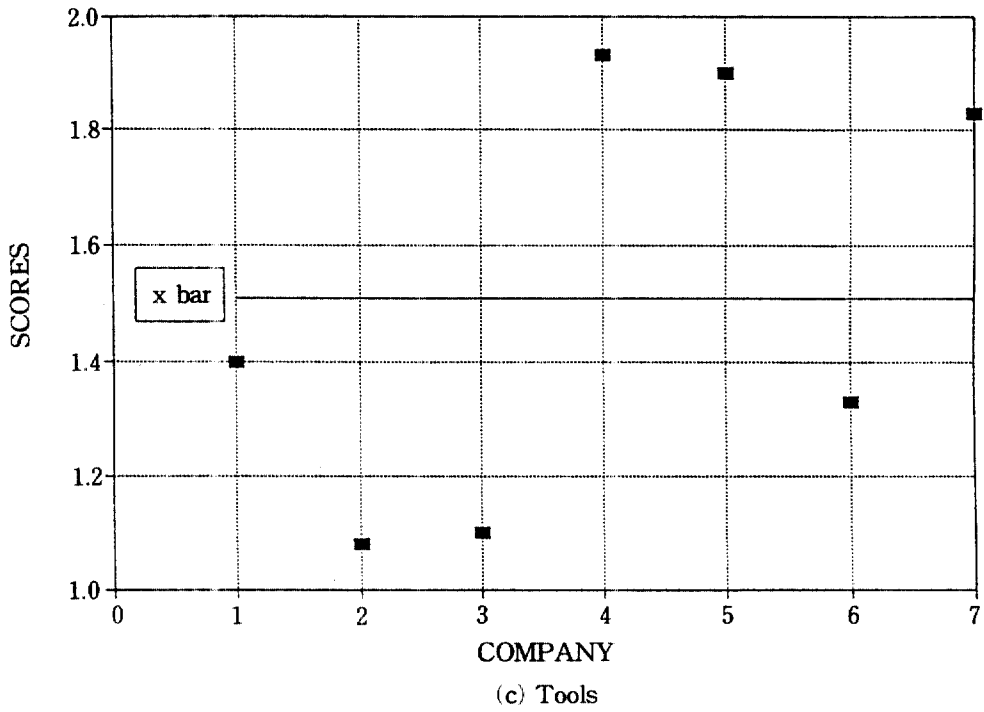


(a) Climate



(b) Processes

< Figure 2 > Average scores of companies for each of the four categories



< Figure 2 > (cont.)

the other 4 in the larger sized industry. The companies, numbered 5, 6, and 7, are the ones included in a larger conglomerates. The number 4 is the Korean subsidiary of the multinational company, whose American counterpart is well known for its quality products in the world. This figure may show the level of general perception of the people in each company. From this figure we see the companies in the small industry sector shows lower scores than the ones in large industry on the perception of Climate. <Figure 2(b)> also shows clearly the different characteristic between the first three companies and the last four ones. Among the large companies Company G marked the highest score. It is not possible to find any significant difference between the service industry and the manufacturing industry. In <Figure 2(c)>, a general different characteristic exists between the large industry and the small industry. However, the number 6 company(Company F) marked a score below the level of average scores achieved by the large industry. Even the number 1 company has obtained a higher score in this category. In <Figure 2(d)>, a general different characteristic exists between the large industry and the small industry. However, the number 6 company, which is Company F, has marked the score below the level of average scores achieved by the large industry. Even the number 2 company has obtained a higher score in this category.

<Table 3> contains the mean averages for the small and the large industry sector in each category. In all categories, the large industry shows higher means. To support our tentative conclusion from the figures, we use the *t*-test.

< Table 3 > Mean scores of small and large industries

industry	category			
	Climate	Processes	Tools	Outcomes
Small	4.03	2.11	1.19	3.65
Large	4.44	2.80	1.69	4.27
difference	-0.41	-0.69	-0.50	-0.62

<Table 4> shows the difference of two means between the small and the large industry in each of the four categories is significant at the level of 5%, 1%, 5%, and 5% respectively. Hence we can conclude that judging based on information given in this survey, we can see significant differences between the means of the large and the small-to-medium industries in all categories. A similar conclusion was discussed in Spain industries [Moreno-Luzon, 1993].



〈 Table 4 〉 Tests on differences between large and small-to-medium industries

I. Climate		II. Processes		III. Tools		IV. Outcomes	
Large	Small	Large	Small	Large	Small	Large	Small
4.51	3.88	2.76	2.24	1.90	1.40	4.32	3.39
4.46	4.24	2.66	2.04	1.33	1.08	3.84	3.93
4.35	4.23	2.99	2.05	1.83	1.10	4.65	3.62
$T = 3.112$		$T = 7.234$		$T = 2.916$		$T = 2.703$	
$t(0.1, 4) = 1.533, t(0.05, 4) = 2.132, t(0.01, 4) = 3.747$							

### 3.3 Comparison Between Domestic And Multinational Companies

As we can see from 〈Figure 2〉, Company D(company 4 in x-axis), which has a strong relationship with its American counterpart and hence is classified as a multinational company for this survey, has outscored the domestic companies in almost all categories. It has the highest scores in the Climate and the Tool categories and is only second in the Process and the Output categories to Company G(number 7). Company G, which is classified as a service company, has achieved the highest scores in the Process and the Output and not so low in the Tool category. But it marked the lowest score in the Climate category among the companies in the large industry. 〈Table 5〉 shows average scores in each category for comparing the small and the large domestic industry with the multinational company. We can see the outscored numbers by the multinational company in all categories. To see how much the domestic small and the large industry reached when compared with the multinational company, we transform the scores in 〈Table 5〉 by dividing by the corresponding score of the multinational company in each category. 〈Table 6〉 shows the relative scores when we set the score of the multinational company by 1. 〈Table 6〉 shows the fact that the domestic industry reaches to the level of 0.83 of the the multinational company's quality management. Individually, the large industry reaches to the level of 0.92 and the

〈 Table 5 〉 Mean scores of the domestic and the multinational companies

industry	category			
	Climate	Processes	Tools	Outcomes
Small	4.03	2.11	1.19	3.65
Large	4.44	2.80	1.69	4.27
Multinational	5.05	2.93	1.93	4.46

small industry to the level of 0.74. The large industry shows the scores near to the level of the the multinational company in the Process and the Output category. It lags behind in the Climate and Tool category, which are areas large industry has to emphasize for its effort and activity toward quality management. The small industry has a lot to catch up with the level of Company D, especially in the areas of Tool and Process categories.

〈 Table 6 〉 Relative scores against the score of the multinational company

industry	category				average
	Climate	Processes	Tools	Outcomes	
Small	0.80	0.72	0.62	0.82	0.74
Large	0.88	0.97	0.88	0.96	0.92
Multinational	1.00	1.00	1.00	1.00	1.00

The Climate category can be subdivided into 5 subcategories: Strategic, Leadership, Work force, Customer, and Communications. In Climate category, we further compare the domestic against the multinational company. In 〈Table 7〉, the subcategory D of Customer is the weakest area for both of the small and the large domestic companies, when compared with the multinational company. Therefore, it is required to develop strong customer-oriented climate in order to enhance quality management practices for Korean industries, whether they are small or large. In a question that 'what is meant by the term Total Quality Management?', Wiele et al. (1993) reports that satisfying external customers is the best choice among 15 factors in Western European industries.

〈 Table 7 〉 Climate comparison of domestic industry against the multinational company

	small	large	Multinational
A. Strategic focus	4.15(0.80)	4.70(0.91)	5.18(1.00)
B. Leadership	4.13(0.83)	4.52(0.90)	5.00(1.00)
C. Work force	4.02(0.80)	4.31(0.85)	5.05(1.00)
D. Customer	4.22(0.75)	4.50(0.80)	5.60(1.00)
E. Communications	3.60(0.82)	4.18(0.95)	4.40(1.00)

## 4. Conclusions

In this paper we tried to answer some questions with regard to a general measure of the width and depth of quality management practices in Korean industries. The results may be used as a guideline for supporting any activities endeavoring to find appropriate methods to boost the quality management in Korea. Also, through comparisational analysis at the macro-level, some characteristics in quality management practices are shown to exist in Korean industries. These can be summarized as follows:

1. No clear distinction has been found for the different characteristics between the service industry and the manufacturing industry sectors.
2. The different characteristic is statistically significant between the large and small industry classification.
3. In all categories the benchmark multinational company outscores the all domestic companies, whether they are large or small. It is quantitatively found that the domestic industry reached to the level of 83% of the multinational company's quality management. Subcategory of customer is the weakest area in the Climate category at the level of 77.5%, when compared to the benchmark company.

Since the analysis is based on the scores of subjective perceptions of the respondents on the quality management practices in each company, the conclusions are only valid under the assumption of homogeneity in terms of the industrial and educational background of the respondents. On this assumption refer to [Malhotra et al., 1994].

## References

- [ 1 ] Box, G. E., Hunter, W. G., and Hunter, J. S. (1978), *Statistics for experimenters*. John Wiley & Sons, New York.
- [ 2 ] Han, B. S. et al. (1994), New way for managing coroperations. Maeil Kyungje Shinmoon, Apr. 22.
- [ 3 ] Hunt, V. D. (1990), *Managing for quality*, Business One Irwin, Homewood.
- [ 4 ] Korea Economic Report (1992), *Foreign companies in Korea*. World Media Inc., Seoul.
- [ 5 ] Kwak, B. J. (editor)(1992), *Annual report of small business*. Korea Federation of Small Business, Seoul.

- [ 6 ] Malhotra, M. K., Steele, D. C., and Grover, V. (1994), "Important strategic and tactical manufacturing issues in the 1990s," *Decision Sciences*, Vol. 25, No. 2, pp. 189–214.
- [ 7 ] Moreno-Luzon, M. D. (1993), "Can total quality management make small firms competitive?," *Total Quality Management*, Vol. 4, No. 2, pp. 165–181.
- [ 8 ] Umeda, T. (1993), "Survey on quality management practices in manufacturing and service sectors," presented at APO Bangkok meeting.
- [ 9 ] Umeda, T., and Watano, T. (1993), "ISO 9000 and Q&P self assessment," presented at APO Bangkok meeting.
- [10] Whang, W. C. (1992), *Quality management*. Bahk Young Sa, Seoul.
- [11] Wiele, T. V., Dale, B. G., Timmers, J., Bertsch, B., and Williams, R. T. (1993), "Total quality management: a state-of-the-art survey of European industry," *Total Quality Management*, Vol. 4, No. 1, pp. 23–38.
- [12] Yun, M. H. (editor)(1993), *Annual report of listed companies*, Korea Listed Companies Association, Seoul.