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**A Comparison of Quality Improvement
Practices in Korea, New Zealand
and the United States of America**

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ABSTRACT

The focus of this paper is the quality of the organization's product or service, More specifically, this study identifies alternative approaches to quality improvement practised in the United States, Korea and New Zealand, and then groups companies by quality improvement practice, measuring group financial and operating success. Factors reflecting approach to improvement could be identified for performance quality in all three countries, productivity in all three countries, and financial results in U.S.A. and Korea.

It can be also observed that for most dependent variables, the regression used multiple factors to explain the relationship. That is, factors which are grouping of improvement approach items, are required to explain quality, productivity, and financial performance. In other words, an individual item, expressed as one approach to quality or productivity improvement, cannot explain performance in a statistically significant manner. Multiple and complex relationships are required to explain performance.

KEYWORDS Quality, productivity, company performance, New Zealand, Korea, USA

A Comparison of Quality Improvement Practices in Korea, New Zealand, and the United States of America

INTRODUCTION

Someone once said that in life today, change is the only constant, and the rate of change is accelerating. In businesses worldwide, what is visible to the general public is the sight of firms undergoing massive changes in structure. During the recession in the U.S.A. in the early 1980s a genuine interest in quality improvement emerged. This interest has been heightened by the economic downturn of the 1990s.

Since 1984, New Zealand has experienced dramatic political, economic and social change. The country has lived with protectionist policies for nearly 50 years. The New Zealand government has moved rapidly to a free market philosophy with a free-floating exchange rate, the removal of high tariffs, and the dismantling of import restrictions, quotas and licenses. The removal of these barriers to competition has severely affected the manufacturing sector. New Zealand consumers now have access to products of higher design, quality, and functionality at lower prices than were previously possible. In Korea, the move to more sophisticated exports, such as semiconductors, has required continuous close attention to quality by managers.

The focus of this paper is the quality of the organization's product or service, More specifically, this study identifies alternative approaches to quality improvement practised in the United States, Korea and New Zealand, and then groups companies by quality improvement practice, measuring group financial and operating success.

LITERATURE REVIEW

World-wide Quality Practices

United States manufacturing strategy in the 1990s reflects the continuing challenges from the 1980s - the need for continuous improvement in quality, costs, and product development. Boston University coordinates a biannual survey of manufacturing executives in about 20 countries, including the United States, Europe Japan and a number of Pacific Rim nations (Miller and Kim, 1990). Their 1990 study identifies the top five strategies for the 1990s. In order of importance (Miller and Kim, p. 11), they are:

- improve conformance quality,

- improve vendor quality,
- reduce unit costs,
- reduce overhead costs, and
- reduce the product development cycle.

The strategic priorities for the Pacific Rim manufacturers are shown in Figure 1 (Kim, K.Y., 1991). They show the highest importance to competing on quality.

For the two previous years, these countries had produced large increases in quality improvement as well as other competitive performance measures (Fig. 2).

The most effective action programs for these countries in the two years 1988-1990 and their most important manufacturing objectives are shown in Table 1. The focus on quality had produced the greatest payoff for these countries. Nevertheless, they still saw the need to improve conformance quality even further as the most important objective.

In New Zealand, payoff from quality programs and their future high emphasis was observed in the results of the 1992 survey (Corbett, 1992) shown in Table 2.

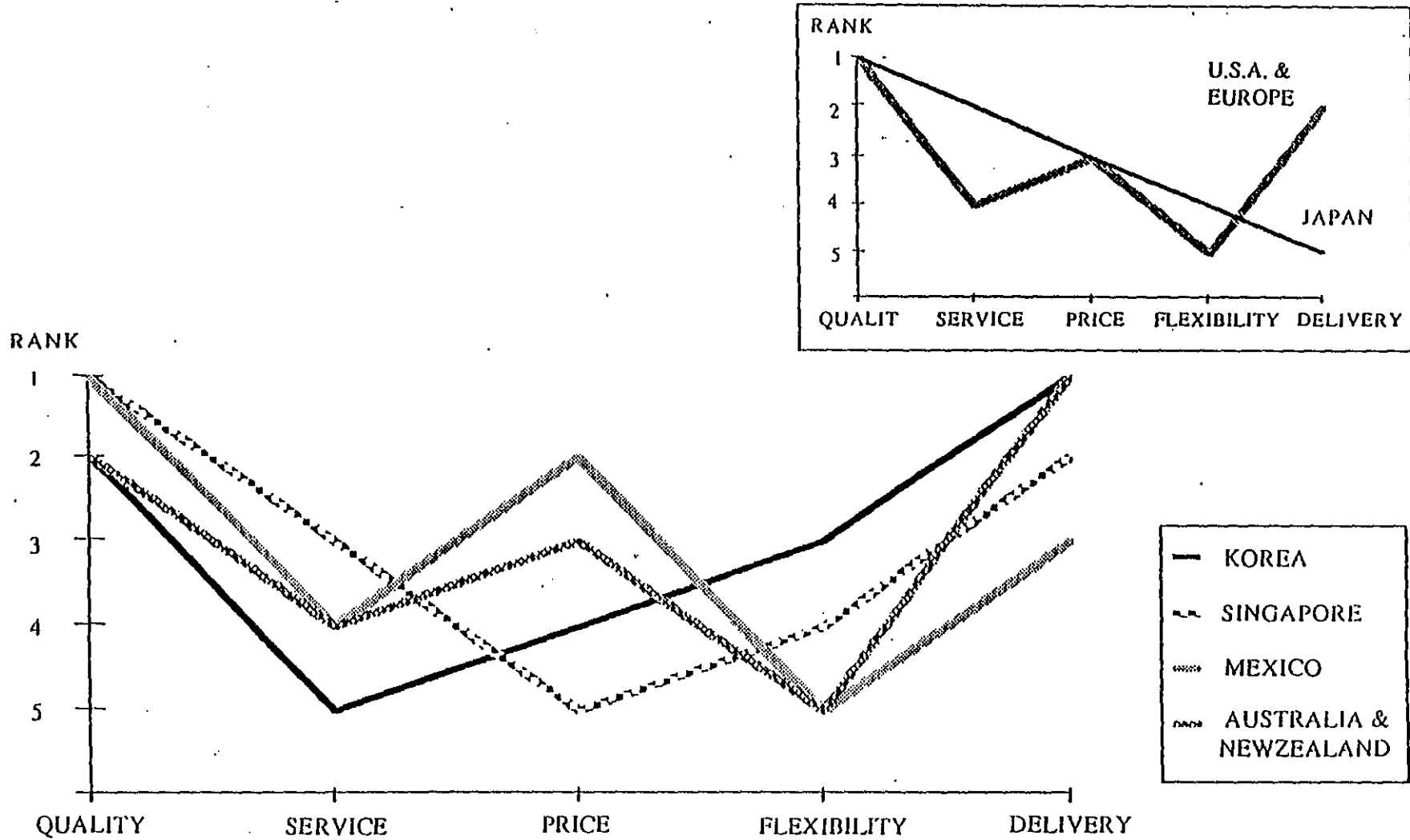
Relevant Empirical Studies on Quality Improvement

Sluti (1992) utilized structural equations modelling to study 184 manufacturing firms in New Zealand. Quality was found to have a positive and significant relationship to performance as demonstrated by productivity-induced improvements of quality. For many of the measured direct relationships between quality and business performance, results were not significant. Yet, the relationship between quality and production/operations outcomes was significant. Quality had significant positive impacts on performance measures for process utilization, process output, production costs, work-in-process inventory levels and on-time delivery.

Benson, Saraph, and Schroeder (1991) propose a system-structure model of quality management that relates organization context, actual quality management, ideal quality management, and quality performance. Their results suggest that organizational context influences managers' perceptions of both ideal and actual quality management. Important contextual variables are corporate support for quality, past quality performance, managerial knowledge, and the extent of external quality demands.

Figure 1

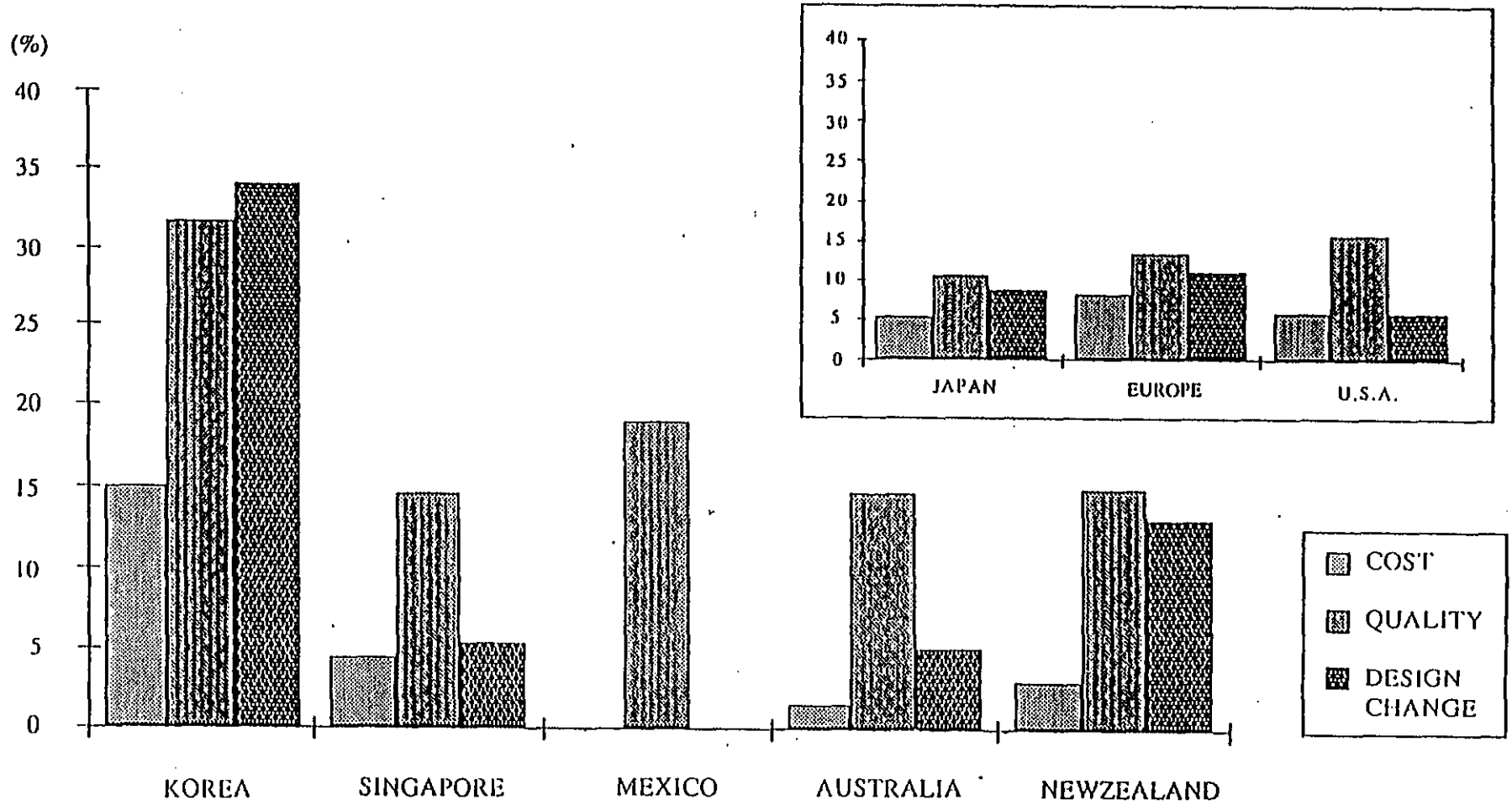
STRATEGIC PRIORITIES, 1990



Source: Kim, K.Y. "Manufacturing Strategies in the Pacific Rim", presentation to Annual Meeting of JPICS, Tokyo, 1991.

Figure 2

IMPROVEMENT IN COST, QUALITY AND FLEXIBILITY (1988-1990)



Source: Kim, K.Y. 1991.

Table 1

TOP FIVE MOST EFFECTIVE ACTION
PROGRAMS IN THE PACIFIC RIM (1988-1990)

-
1. Quality Control
[Korea (2), Singapore (3), New Zealand (4), Mexico (5)]
 2. Reconditioning Physical Plants
[Korea (1), Mexico (2), Australia (5)]
 3. Supervisor/Worker Training
[Singapore (1), Korea (3), Mexico (3)]
 4. Linking Mfg. Strategy to Business Strategy
[New Zealand (1), Australia (3), Singapore (4)]
 5. Manufacturing Reorganization
[Australia (1), New Zealand (2)]
-

TOP FIVE MOST IMPORTANT MANUFACTURING
OBJECTIVES IN THE PACIFIC RIM (1990)

-
1. Improve Conformance Quality
[Korea (1), Singapore (1), Australia (1), Mexico (2), New Zealand (3)]
 2. Improve Direct Labor Productivity
[Mexico (1), New Zealand (1), Singapore (2), Korea (3), Australia (5)]
 3. Reduce Unit Cost
[Korea (2), New Zealand (2), Australia (2), Mexico (3), Singapore (4)]
 4. Reduce Overhead Cost
[Australia (3), New Zealand (5)]
 5. Labor Relations
[Korea (4), Mexico (4)]
-

Source: Kim, 1991.

Table 2

MOST EFFECTIVE PROGRAMS IN NEW ZEALAND 1990-1992

1. Quality assurance
2. Manufacturing reorganization
3. Linking manufacturing strategy to business strategy
4. Quality function deployment
5. Improved production and industry control system

MOST EMPHASIS FOR NEXT TWO YEARS

1. Quality assurance
 2. Giving workers broader tasks/more responsibility
 3. Worker training
 4. Supervisor training
 5. Quality function deployment
-

Source: Corbett, L.M. "Turning Point in Manufacturing: Executive Summary of the 1992 New Zealand Manufacturing Futures Survey", Wellington, Victoria University, 1992.

Specifically, here the work of Benson, Saraph, and Schroeder (1991) is extended to include a wider array of contextual variables, an alternative set of quality improvement practices or approaches, and a full array of performance variables - both operational and financial performance measures.

RESEARCH QUESTION, EXPERIMENTAL DESIGN, AND PROCEDURE

Research Question

There exist alternative approaches to quality improvement. This study investigates the relation between quality and productivity improvement and actual performance.

More specifically, the following hypotheses are addressed in this study:

1. A performance and demographic profile can be constructed for high quality, high productivity, and profitable companies that differs from the lowest performers on those same dimensions.

1 (a): A company's approach to quality improvement dictates the performance and demographic profile.

1 (b): A company's approach to productivity improvement dictates the performance and demographic profile.

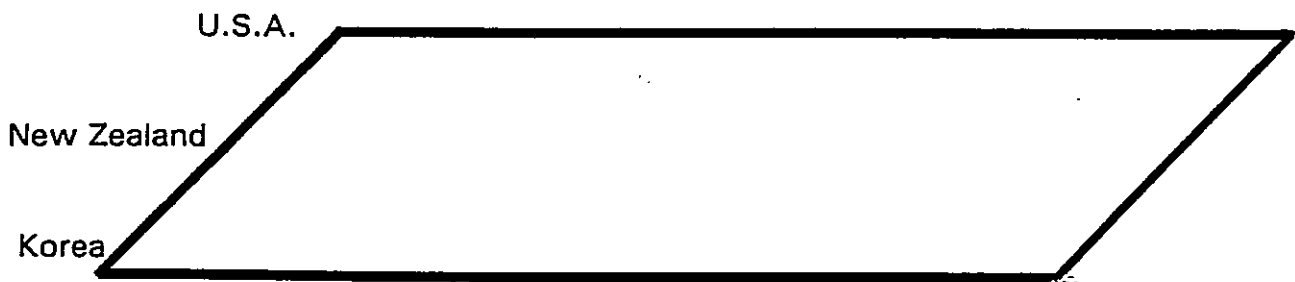
Experimental Design

The experimental design is summarized in Table 3. Two independent variables - quality and productivity improvement interventions - are independently and jointly related to four dependent variables - actual quality and productivity, financial performance, and company demographics. There are multiple levels of the independent variables and multiple measures as indicated in Table 3 and the previous discussion. This design is replicated in each of the three nations.

Procedure

In each country, a survey of practising manufacturing and non-manufacturing firms was conducted, each firm receiving a survey instrument with over one hundred questions (items). In the U.S.A. the primary source of companies was SIC and geographical listings where the company's address and telephone number were available. In New Zealand, the source was

Table 3
Experimental Design



<u>Independent Variable (Levels)</u>	<u>Dependent Variables (Measures)</u>
Quality improvement interventions (6)	Actual quality (8)
Productivity improvement interventions (8)	Actual productivity (3)
	Financial performance (3)
	Company demographics

membership in the Wellington Manufacturers' Association and the Wellington Quality Improvement Network. The executives sampled were responding only concerning their company.

The general procedure was to telephone the company and ask for the chief production or operations officer. Willingness to participate in the study from those reached by telephone was quite high and the actual return rate in the U.S.A. was 38.8%, 196 returned from 505 questionnaires mailed. From the 196 returns, 187 were usable responses. In New Zealand, the response rate was 43.5%, resulting in 71 usable responses. In Korea, 101 usable responses were received.

Questionnaire. The questionnaire content reflected the research design and was thus based on the research literature on quality and productivity improvement. A primary source of questions was Benson, Saraph, and Schroeder (1991), in which they utilized the instrument designed, verified, and validated by Saraph, Benson, and Schroeder (1989). In the 1991 study, the twenty-six measurement items for organizational quality context were assessed (Benson et al., 1991, Appendix A).

Other sources were the 1991 Malcolm Baldrige National Quality Award (U.S. Department of Commerce, 1991), and research on productivity improvement, flexible, manufacturing, and job satisfaction.

Demographic Characteristics of the Participants

Respondents tended to be from a wide distribution of firm sizes. Table 4 summarizes the demographic characteristics of the respondents in the three countries.

Analysis Procedures

Data included responses to Likert scale questions (circled 1 through 7), ordinal scaled numbers, and essay responses. A factor analysis was conducted on the quality and productivity improvement responses to determine which items were answered similarly. The SAS System factor analysis routine was selected and a principal components analysis was conducted. Factor scores were the average of the items with factor loadings exceeding 0.400. Twenty items were selected.

Table 4

Demographic Characteristics of Respondents

	U.S.A.	New Zealand	Korea
N	187	71	101
Avg # employees	3770	595	1199
Avg annual sales (million U.S.\$)	914	32	233
Median # employees	500	150	800
Median annual sales (million U.S.\$)	10	7.5	115
Years in business	40.7	42.8	24.3
Percent employees involved in quality improvement	50.3	43.3	59.7
Quality department exists	81%	42%	97%
Formal approach to			
— quality for	7.1 yrs	5.3 yrs	9.0 yrs
— productivity for	9.7 yrs	6.5 yrs	7.2 yrs

The most represented items from the literature review, with the highest probability of explaining alternative approaches to quality and productivity improvement, were factor analyzed. After the factor analysis, a step-wise multiple regression was conducted to test the hypotheses. The independent variables, expressed as factor scores condensed from the item responses, were regressed against the dependent variables, quality, productivity, and financial performance.

RESULTS

Quality and Productivity

Table 5 identifies the 20 items that were factor analyzed, 13 of which are quality improvement indicators, and 7 of which are productivity improvement indicators. The resulting factor patterns included eight factors in the U.S.A., nine factors in Korea and six factors in New Zealand. These factors captured over 77, 74, and 67 percent of the variance respectively.

Factor 1 is broadly defined by 15 of the 20 items in the U.S.A., 15 in Korea, and 12 in New Zealand. There is a considerable degree of overlap in the items in factor 1 in the three countries. Quality items that involve management and employee behaviours have strong factor scores: involving employees, management involvement, project teams, and quality training to meet employee needs. Somewhat similarly, productivity items that are behavioural have strong factor scores: decision-making at lower levels, objective feedback, and employee satisfaction. Non-behavioural productivity items that carried high scores include effective inventory planning and control, and improving quality. In Korea, factor 2 loads only on the attempts to expand knowledge in the quality area.

In the U.S.A., factor 2 captures two items which would not positively affect quality improvement - applying no formal approach and crisis-based management - and a third that is questionable - inspection as a nonconformance method.

The last mentioned loaded heavily on factor 2 in the New Zealand results, and crisis-based management was also captured more positively. This factor captured the items expanding knowledge (as for Korea) and use of SPC and some traditional approaches - conformance emphasis, industrial engineering and effective inventory planning and control.

Factor 3 in the U.S.A. could be viewed as traditional approaches - traditional industrial engineering, expanding one's knowledge about quality, and inspection as a conformance

Table 5
Quality and Productivity Factor Analysis for Three Countries
 (Note: USA = F1, F2... Korea = K1, K2,... New Zealand = Z1, Z2...)

Items	Factor Pattern											
	F1	K1	Z1	F2	K2	Z2	F3	K3	Z3	F4	K4	Z4
Quality (Improved at my company by...)												
•attempt to expand knowledge in quality area					X	X	X					
•applying no formal approach				X					X			
•statistical process control (SPC)		X				X				X		
•involving employees	X	X	X									
•management's involvement & responsibility	X	X	X									
•identifying & resolving improvement projects	X	X	X									
•crisis based — attention after a failure	X			X		X					X	
•reward focused — pay for quality performance	X							X		X		
•activity seeking customers' views	X	X	X									X
•inspectors try to assure conformance to specs		X		X		X	X	X				
•quality practice reflects design emphasis	X	X	X					X	X			
•quality practice reflects conformance emphasis	X		X			X						
•quality training addressing employee needs	X	X							X			
Productivity (improved at my company by...)												
•traditional industrial engineering		X	X			X	X			X		
•effective inventory planning & control	X	X	X			X						
•improving quality	X	X	X									
•employee biographical data in selection	X	X		X								
•placing decision-making at lower levels	X	X	X									
•providing objective feedback on performance	X	X	X									
•employees satisfied with the company	X	X	X									

Table 5 (cont.)
Quality and Productivity Factor Analysis for Three Countries
 (Note: USA = F1, F2... Korea = K1, K2,... New Zealand = Z1, Z2...)

Items	Factor Pattern										
	F5	K5	Z5	F6	K6	Z6	F7	K7	F8	K8	K9
Quality (Improved at my company by...)											
•attempt to expand knowledge in quality area											
•applying no formal approach					X						
•statistical process control (SPC)											
•involving employees											
•management's involvement & responsibility				X							
•identifying & resolving improvement projects											
•crisis based — attention after a failure											
•reward focused — pay for quality performance		X									
•activity seeking customers' views							X				
•inspectors try to assure conformance to specs						X					
•quality practice reflects design emphasis					X			X	X		
•quality practice reflects conformance emphasis	X										
•quality training addressing employee needs											
Productivity (improved at my company by...)											
•traditional industrial engineering											
•effective inventory planning & control											
•improving quality											X
•employee biographical data in selection			X								
•placing decision-making at lower levels											
•providing objective feedback on performance	X										
•employees satisfied with the company											

method. For Korea, factor 3 also captured inspection as well as design emphasis and a reward focus. In New Zealand, this factor captured quality training, a design emphasis as well as "no formal approach".

The remaining factors for each country generally comprised only one item with a loading of 0.400 or higher, indicating a rather weak exploratory value for each factor.

The crux of this study is the attempt to explain how these quality and productivity improvement factors relate to actual quality, productivity, and financial performance. The regression summarized in Table 6 provides the stepwise regression procedure that best defines or explains the dependent variable in terms of the independent variables. Due to space limitations, only the Korean and New Zealand results are presented here. Only the statistically significant variables at a level of significance less than 0.05 are reported. Dependent variables where no relationship was found for the U.S.A. results include average percent of items defective, scrap as a percent of sales, and sales growth.

In Korea, there was a relationship found with an average percent of items defective but not with total cost of quality, inspection, rework nor training and development. Only two dependent variables in the New Zealand results were found to be significant - training and development and customer satisfaction.

The productivity and financial results indicated some promise except in New Zealand. Significance was good, but the R^2 s were generally low. In the U.S.A., performance quality results significantly related several factors at $p < 0.01$. For example, total cost of quality regressed against F3 and F5, with an F-ratio of 5.75 and $R^2 = 0.1256$. It was especially encouraging to note that in the U.S.A., net profit can be explained (or predicted) at the $p < 0.01$ level and return-on-assets at the $p < 0.05$ level. Factor 8 was the primary determinant for each and loaded most heavily on "quality practice reflects a design emphasis."

In New Zealand, only the dependent variable employee satisfaction was significant and none of the financial variables proved significant.

In Korea, of the productivity dependent variables, employee turnover ($R^2 = 0.0806$, F ratio 6.14) and employee satisfaction ($R^2 = 0.3731$, F ratio 16.47) were significant at $p < 0.01$ level. Korea was the only country in which all 3 financial dependent variables were significant.

Table 6

Quality and Productivity Regression Summary — Korea

Stepwise Regression Procedure	Dependent Variables						
	Performance Quality		Productivity		Financial		
	% Defective	Customer Satisfaction	Annual Employee Turnover Rate	Employee Satisfaction	Last Year's Return on Assets	Past 3 Year's Return on Assets	Past 3 Year's Sales Growth
Intercept	7.924	1.342	4.918	1.552	-5.203	-12.789	-23.555
Regression component (Parameter estimate)	K2(-0.519) K3(0.585)	K1(0.806) K4(0.097) K6(0.0917)	K6(1.989)	K1(1.126) K3(-0.250) K4(-0.206)	K6(0.922) K7(1.657)	K4(2.063) K5(-1.987) K6(1.378) K7(2.432)	K1(9.689)
R	0.2961*	0.6447**	0.2839**	0.6108**	0.3619**	0.6625**	0.3223**
R ²	0.0877	0.4157	0.0806	0.3731	0.1310	0.2139	0.1039
F ratio	3.75	19.68	6.14	16.47	4.75	3.81	8.12

*p<0.05

**p<0.01

Table 6 (Cont.)

Quality and Productivity Regression Summary — New Zealand

Stepwise Regression Procedure	Dependent Variables			
	<u>Performance Quality</u>		<u>Productivity</u>	<u>Financial</u>
	Training and Development	Customer Satisfaction	Employee Satisfaction	None significant
Intercept	-3.177	3.014	0.6779	
Regression component (Parameter estimate)	Z3(1.305)	Z4(0.3664)	Z1(0.5665) Z3(0.2623)	
R	0.4422*	0.3393*	0.5604**	
R ²	0.1955	0.1151	0.3141	
F ratio	5.10	5.33	9.16	

*p < 0.05

**p < 0.01

Factor 1, which captured 15 of the 20 items, was the determinant for the variable "past 3 years sales growth".

DISCUSSION AND CONCLUSIONS

The proposed hypothesis is interested in examining interactions between quality improvement approach, productivity improvement approach, and performance. Performance is captured by quality, productivity, and financial measures. Table 6 presents the results of this results.

Firstly, it can be concluded when reviewing the results that factors reflecting approach to improvement could be identified for performance quality in all three countries ($p < 0.01$ in U.S.A., $p < 0.05$ in Korea and New Zealand), productivity in all three countries ($p < 0.01$), and financial results in U.S.A. ($p < 0.05$) and Korea ($p < 0.01$).

Secondly, it can be observed that for most dependent variables (columns of Table 6), the regression used multiple factors to explain the relationship. That is, factors which are grouping of improvement approach items, are required to explain quality, productivity, and financial performance. In other words, an individual item, expressed as one approach to quality or productivity improvement, cannot explain performance in a statistically significant manner. Multiple and complex relationships are required to explain performance.

What is the profile that would best improve performance? Each country will be considered in turn.

Performance Quality as the Objective

Korea. From Table 6, the measures to focus on are average percent defective and customer satisfaction. So improvements should focus on factors K1, K2, K3 and K4. These factors encompass approaches that include management and employee involvement, training in quality and use of SPC and other industrial engineering techniques, expanding one's knowledge about quality, rewarding quality performance, design emphasis and rewarding crisis-based management after a failure.

New Zealand. Improvement should focus on factors Z3 and Z4. These factors encompass training and development expenditure, emphasis on design and customer satisfaction. Factor Z3 also includes the item "no formal approach." Perhaps this suggests that,

with sufficient emphasis on workforce quality training, the absence of a formal quality plan does not matter.

U.S.A. The measures emphasized might be total cost of quality ($p < 0.01$, $R^2 = .1256$) and training and development costs as a percent of sales ($p < 0.01$, $R^2 = 0.1660$). Improvement should utilise factors F2, F3, F5, and F6. These factors encompass improvement approaches that are traditional (industrial engineering, expanding one's knowledge about quality, and inspection), quality training to address the employees needs, and management becoming involved and accepting responsibility for improvement. Respondents made it clear one should use some formal approach to quality and not follow crisis-based management after a failure.

Productivity Improvement as the Objective

Korea. Employee turnover ($p < 0.01$) and employee satisfaction ($p < 0.01$) can both be influenced significantly. Improvement should utilise factors K1, K6, K8, and K9. The factors include the broad approach of SPC, employee involvement, management involvement, improvement teams, and customer satisfaction. Emphasis on design, inventory reduction, delegation and feedback on performance.

New Zealand. Employee satisfaction ($p < 0.01$) was the only productivity variable that was significant. Factors that influence employee satisfaction were Z1 and Z3. That is, a wide array of both quality and productivity approaches, as for Korean factor K1 discussed above, and training and development.

U.S.A. Employee turnover ($p < 0.05$), net profit ($p < 0.01$), and employee satisfaction ($p < 0.01$) can all be influenced significantly. Factors that influence productivity include F1, F3, F4, F5, and F8. As for Korea and New Zealand, these involve a wide array of both quality and productivity improvement approaches (items) as presented in Table 5. Management involvement, employee involvement, project teams, training and development, inventory reduction, objective feedback on performance, and emphasizing design are all important approaches.

Financial Performance as the Objective

Korea. Of the three countries under consideration in this paper, Korea was the only one for which all three financial dependent variables could be influenced significantly. The factor

that influenced sales growth was the broad-approach factor K1 discussed above. The two return-on-assets (ROA) variables are influenced by K4, K5, K6, and K7. Factor K5 suggests pay for performance and delegation of decision-making. The other factors include approaches which seem very reactive: inspection, crisis-based management, and no formal approach.

New Zealand. There were no significant relationships between the approaches and the financial performance of the New Zealand respondents. This finding confirms the results of Sluti (1992), for New Zealand manufacturing firms, where he found no significant relationship between quality approach and business performance.

U.S.A. Both measures of return-on-assets (ROA) can be influenced ($p < 0.05$). Annual sales growth could not be explained by these improvement factors. Factors that influence ROA are F2 and F8. These suggest an emphasis on design and, as for Korea, a number of reactive approaches - crisis-based management, inspection to ensure conformance, and no formal approach.

In conclusion, this study confirmed and extended the work of Benson, Saraph, and Schroeder (1991). Factors were identified that capture approach to quality improvement (Benson et al.) and to productivity improvement. In each country, a profile emerges for the organisation as to what techniques toward improvement might be most useful if the objective is to improve quality, and productivity, and/or financial performance.

In Korea and the U.S.A, where financial performance could be influenced, there were similar approaches which, rather ironically, included crisis-based management, inspection to ensure conformance, and no formal approach to quality. This is a disappointing finding and suggests that management may still lack total faith in the broad approach for when there is a problem, the response is inspection and abandonment of any quality plan.

REFERENCES

- Benson, P. G., Saraph, J. V., and Schroeder, R. G. "The Effects of Organizational Context on Quality Management: An Empirical Investigation", Management Science, Vol. 31, No. 9, September 1991, pp. 1107-1124.
- Corbett, L. M. Turning Point in Manufacturing: Executive Summary of 1992 New Zealand Manufacturing Futures Survey. Wellington, Victoria University, 1992.
- Kim, K. Y. Manufacturing Strategies in the Pacific Rim, Presentation to Annual Meeting of Meeting of JPICS, Tokyo, 1991.
- Miller, J. G. and Kim, J. S. Beyond the Quality Revolution: U.S. Manufacturing Strategy in the 1990s, A Research Report of the Boston University School of Management Manufacturing Roundtable, Boston, Massachusetts, 1990.
- Saraph, J. V., Benson, P. G., and Schroeder, R. G. "An Instrument for Measuring the Critical Factors of Quality Measurement", Decision Sciences. Vol. 20, No. 4, Fall 1989, pp. 810-829.
- Sluti, D.G. Linking Process Quality with Performance: An Empirical Study of New Zealand Manufacturing Plants, Ph.D. Dissertation, The University of Auckland, Auckland, N.Z., 1992.
- United States Department of Commerce. 1991 Application Guidelines Malcolm Baldrige National Quality Award, 1991, 43 pp.

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