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Relationships Between Soft TQM, Hard TQM, and Organisational Performance

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TITLE: **Relationships Between Soft TQM, Hard TQM, and Organisational Performance.**

ABSTRACT: Many empirical studies have demonstrated that only a handful of soft total quality management (TQM) elements contribute to organisational performance while elements of hard TQM have no relationship with performance. Despite these findings, a review of literature suggests that the elements of hard TQM in fact have a profound impact on organisational performance. The empirical studies which have investigated the relationship between hard TQM and performance have investigated the impact of each dimension of TQM on performance separately. We argue that it is more appropriate to investigate the direct impact of soft TQM on the diffusion of hard TQM in organisations and then assess the direct impact of hard TQM on performance. Besides direct effects, it is also important to investigate the indirect effect of soft TQM on performance through its effect on hard TQM elements. Analysis of 260 Australian manufacturing companies revealed that both soft TQM and hard TQM contribute directly to organisational performance. The results also indicate that there are significant positive relationships between the elements of soft TQM and those of hard TQM. Moreover, in addition to its direct affect, the elements of soft TQM also indirectly affects an organisation's performance through its effect on hard TQM elements.

KEY WORDS: Australian manufacturing companies, empirical study, performance, hard TQM, soft TQM.

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Literature Review and Hypotheses

Empirical studies which have examined the relationship between the total quality management (TQM) and organisational performance have investigated the impact of each dimension of TQM on performance separately (Powell, 1995; Dow *et al*., 1999; Samson and Terziovski, 1999; Rahman, 2001). This approach is illustrated in Figure 1. These studies indicated that only a handful of the soft aspects of TQM dimensions (*ie*, 'human factors' like commitment, team work and so on) contribute to organisational performance. Our contention is that soft TQM has two roles. One is to create an environment where seamless diffusion and implementation of hard TQM can take place, and the other is to directly affect organisations' performance in the same way that traditional human resource management (HRM) practices can impact on an organization (Ahire *et al*. 1996). Thus we suggest that the previous attempts to identify the relationships between elements of TQM and organisational performance are not fully appropriate. In this study we propose a more logical approach to study these relationships as depicted in Figure 2. Other researchers who support our contention are Hart and Schlesinger (1991), Bowen and Lawler (1992), and Kochan *et al.* (1995).

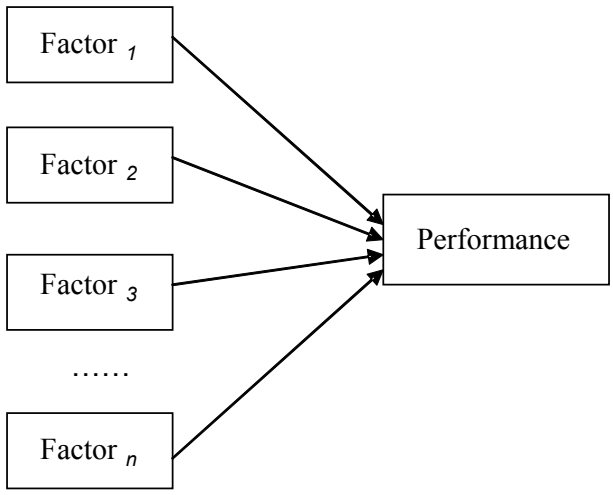

Figure 1: Effects of the elements of TQM on performance as individual factors

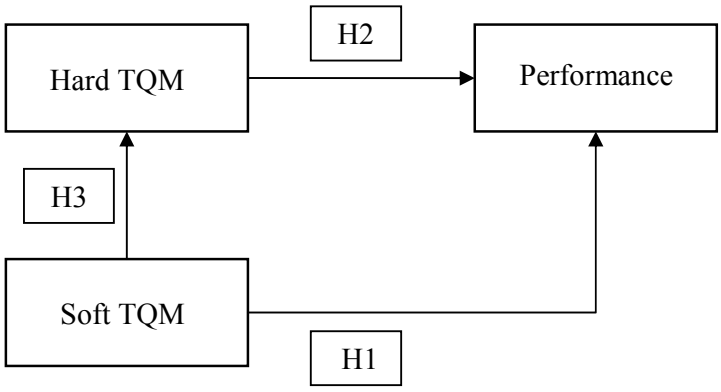

Figure 2: Proposed model: effects of soft and hard TQM on

Figure 2 hypothesises that soft TQM will affect hard TQM elements, in addition to having a direct impact on the performance. For simplicity, this does not show all direct and indirect paths expressed by the model. In this approach, we employed six elements of soft TQM used by Dow *et al.* (1999) and the four elements of hard TQM adopted by Power *et al.* (2001). Organisational performance is expressed in the seven variables used by Samson and Terziovski (1999). These items are discussed in greater detail in the methodology section.

Soft TQM and Organisational Performance

Powell (1995) found only three of his 12 soft TQM factors (executive commitment, open organisation, and employee empowerment) to be significantly correlated with overall corporate performance. Through a study of Australian manufacturing companies, Dow *et al*. (1999) also found that out of a total of 9 factors, only the three items of workforce commitment, shared vision, and customer focus of their had significant positive association with organisational performance. Ahire *et al.* (1996) reached a similar conclusion in their study of the automobile and auto component companies in the US. They found that performance [product quality] was highly correlated with elements of soft TQM such as employee empowerment, employee training and employee involvement.

The elements of soft TQM are essentially dimensions of HRM. The coverage of the soft TQM elements in the management literature is extensive and the prescriptions offered by both disciplines (management literature and TQM literature) are very similar. Dean and Bowen (1994) concluded that three out of six criteria of the MBNQA (Malcolm Baldridge National Quality Award) framework (leadership, HRM and strategic quality planning) are extensively covered in the management literature. These are elements of soft TQM. Powell (1995, p.15) concluded that 'organisations that acquire them [elements of soft TQM] can outperform competitors without the accompanying TQM ideology'. These studies suggest that:

H1: Soft TQM elements have direct effects on organisational performance.

Hard TQM and Organisational Performance

Recently, Sitkin *et al.* (1994) proposed that the common guiding principles of TQM can be grouped into three clusters: (1) those focusing on customer satisfaction, (2) those stressing continuous improvement, and (3) those that treating organizations as total systems. Of these groups, hard TQM relates to the principles of clusters (2) and (3). If only the elements of soft TQM affect organisational performance, then the obvious question is: what is the role of the elements of hard TQM? Although, Powell (1995), Dow *et al*. (1999) and Ahire *et al.* (1996) found that measures of SPC (statistical process control), the use of benchmarking, and flexible manufacturing systems to be unrelated to performance, a review of the management literature suggests that the elements of hard TQM in fact have a profound impact on organisational performance. For instance, product and process benchmarking has resulted in optimal product design and process cost reduction at companies such as DuPont, Ford, Motorola, Xerox and General Motors (Main, 1992; Templin, 1992). Other examples include the impact of six sigma process in Motorola and other companies (McFadden,1993), QFD in Toyota (Sullivan, 1987), seven simple tools in Honda (Maul and Gillard, 1994), SPC in Motorola (Kumar and Gupta, 1993) and Taguchi methods in Mazda and Ford (Taguchi, and Clausing,1990). These studies suggest that:

H2: Hard TQM elements have direct effects on organisational performance.

Soft TQM and Hard TQM

While top management acts as a driving force for TQM, its commitment has to be translated into specific strategies. Strategies that allow an organisation to achieve superior organisational performance include: designing quality into products and services, assuring in-process quality through the use of defect prevention methods and control tools as well as judicious use of quality information such as customer feedback, benchmarking and charts (Ahire *et al*., 1996). In order to implement these strategies successfully, organisations have to be customer focused, maintain competent, reliable and flexible suppliers, and ensure full employee participation through training and empowerment (Ahire *et al.* 1996). Research by Bowen and Lawler (1992, Hart and Schlesinger (1991), Ebrahimpour and Withers (1992) and Kochan, *et al.* (1995) also support this view. It can therefore be suggested that;

H3: Soft TQM has direct effects on the adoption and utilisation of hard TQM elements.

H4: Soft TQM indirectly affects an organisation's performance through its effect on hard TQM elements.

H3 proposes that the (positive) effects of soft TQM on performance can be enhanced by linking them with appropriate hard TQM elements. From H4 it follows that if the required hard TQM element is inappropriate to the elements soft TQM, the indirect effects may be negative, even when the direct effects of soft TQM are positive.

Methodology

In this section we discuss sample and data collection procedures and operational measures of variables used in the study as well as the statistical tests used to evaluate the hypothesis.

Sample

This study is based on the data set collected as part of a survey of manufacturing companies in Australia and New Zealand undertaken by the Australian Manufacturing Council (AMC) in 1994. Some of the major studies which investigated the relationship between TQM practices and organisational performance have also utilised this data set (*e.g*., Dow *et al*., 1999; Samson and Terziovski, 1999). Since our aim is to ascertain the findings of the previous studies in addition to evaluating other forms of relationships between soft TQM, hard TQM, and performance, these data are also used in this study. A total of 3000 Australian manufacturing sites were surveyed of which 962 sites responded, yielding a response rate of 32 percent. A telephone survey of 108 non-respondents was conducted to assess the response bias and no response bias was found (AMC, 1994). Since the survey instrument consisted of a large number of questions (a total of 260 questions), the results of the survey was also tested for respond fatigue and awareness of respondents. The test suggests that the length and complexity of the survey instrument did not seriously affect the quality of the replies.

Close examination of the data set revealed an excessive number of unanswered questions, mainly in relation to the questions on hard TQM practices. A data set was therefore created from companies that used at least 6 of the 11 technology items and provided valid responses for the soft TQM and performance related items. This produced a total of 261 companies from the original data set of 962. Means were then used to infill remaining non-valid responses for the hard TQM items.

Operational Dimensions of Soft TQM

Soft TQM dimensions were adopted from study by Dow *et al.* (1999). As shown in Table 1, a total of 25 items were identified as soft TQM practices. These items were grouped into six elements (scales) and coefficient alpha were calculated for each element. The reliability coefficient (Cronbach's alpha) of the elements ranged between 0.70 (Co-operative supplier relations) and 0.84 (Workforce Commitment) (Table 1). The alpha values indicate that each dimension is a sufficiently reliable measure (Nunnally, 1967).

Element	Item	Factor Loading	Alpha score
F1: Workforce Commitment	1. Proactively pursue continuous improvement	0.68	0.84
	2. Ideas from production operators are actively used	0.72	
	3. Has effective "top-down" and "bottom up" communication	0.69	
	4. Encourage change and a culture of trust and innovation	0.61	
	5. The concept of the "internal customer" is well understood	0.57	
	6. Unity of purpose and eliminated barriers between people	0.66	
	7. Employee flexibility, multi-skilling and training are used.	0.58	
	8. All employees believe that quality is their responsibility	0.48	
F2: Shared Vision	1. Written statement of strategy clearly articulated and agreed to	0.74	0.80
	2. Have a comprehensive and structured planning process	0.69	
	3. Mission statement communicated and supported by employees	0.60	
	4. Our plans always incorporate customers, suppliers and other stakeholders	0.56	
	5. Have organisation wide training and development	0.58	
	6. Systematically and regularly measured external customer satisfaction	0.60	
F3: Customer Focus	1. Customer requirements are disseminated and understood	0.87	0.74
	2. Know our customers current and future needs	0.74	
F4: Use of teams	1. Proportion of production operators in quality of circles	0.81	0.77
	2. Production of production operators in problem solving teams	0.75	
	3. Production of production operators in cellular work teams	0.60	
F5: Personnel training	1. Days of on-going middle management training per year	0.94	0.83
	2. Days of on-going senior management training per year	0.79	
	3. Days of on-going production operator training per year	0.63	
F6: Co-operative supplier relations	1. Work closely with suppliers to improve each others' processes	0.86	0.70
	2. Suppliers work closely with us in product development	0.70	
	3. Suppliers have an effective system for measuring their quality	0.38	

Table 1: Items of the Soft TQM dimensions

Operational Dimensions of Hard TQM

The items used by Dow *et al.* (1999) to identify hard TQM practices were considered to be too narrow. Hard TQM items were therefore adopted from study by Power *et al.* (2001). These items are shown in Table 2. A total of 13 items were identified as indicators of hard TQM practices. These items were grouped into four elements (scales) and coefficient alpha was calculated for each. The reliability alpha values of the elements ranged between 0.55 (Technology utilisation) and 0.86 (Computer-based technologies) (Table 2). The alpha value of 0.55 for the technology utilisation scale is considered low, but it was left intact on the basis of its construct and face validity.

Element	Item	Factor Loading	Alpha score
F7: Computer based technologies	1. Extent of contribution to competitive position: computer aided design (CAD) and/or computer engineering	0.73	
	2. Extent of contribution to competitive position: CAD output used to control manufacturing machines	0.80	
	3. Extent of contribution to competitive position: computer-numerically controlled (CNC) machines	0.62	0.86
	4. Extent of contribution to competitive position: local are network (LAN) for technical data	0.69	
	5. Extent of contribution to competitive position: electronic data interchange (EDI)	0.67	
	6. Extent of contribution to competitive position: computer integrated manufacturing	0.54	
F8: Just-in-time methodology	1. Contribution of just-in-time to factory operations	0.79	
	2. Extent of contribution to competitive position: just-in-time	0.79	0.74
F9: Technology utilisation	1. Our core manufacturing technology (e.g. type or age) is appropriate for our needs and allows us to be competitive in the market place	0.73	0.55
	2. We utilise out manufacturing technology to its maximum potential	0.72	
F10: Continuous improvement enablers	1. Extent of contribution to competitive position: flexible manufacturing cells (FMC) or systems (FMS)	0.54	
	2. Extent of contribution to competitive position: total quality management (TQM)	0.56	0.69
	3. Extent of contribution to competitive position: value adding management (VAM)	0.77	

Table 2: Items of the Hard TQM dimensions

Operational Measures of Organisational Performance

The items related to organisational performance were adopted from Samson and Terziovski (1999). This construct has seven items and was considered to be more comprehensive than the four items used in the study by Dow *et al.* (1999). These items are shown in Table 3.

Element	Item	Factor Loading	Alpha score
F11: Organisational Performance	1. Customer satisfaction	0.677	
	2. Employee morale	0.598	
	3. Productivity	0.524	
	4. Defects as a percentage of production volume	0.618	0.674
	5. Delivery in full on time to customer	0.554	
	6. Warranty claims cost as percentage of total sales	0.457	
	7. Cost of quality as a percentage of total sales	0.574	

Table 3: Items related to organisational Performance

Methods used to evaluate Hypotheses

Simple regression analysis was used to evaluate H1, H2, and H3 and hierarchical regression was used to evaluate H4. The relationship of each soft TQM element to each measure of organisational performance was investigated after controlling for the effect of hard TQM on organisational performance. This analysis of standardised partial beta estimates from hierarchical regression takes into account that (1) soft TQM elements can have a direct effect on either hard TQM elements or measures of organisational performance (or both) and (2) soft TQM elements can have an indirect effect on organisational performance through elements of hard TQM.

Results

H1: Relationship between soft TQM and Performance

The correlation between six elements of soft TQM and seven measures of organisational performance are shown in Table 4. The results can be analysed in two ways: the column-wise and row-wise count of correlation coefficients. The column-wise count shows the degree to which the seven measures of performance are affected by each element of soft TQM. The correlation matrix shows show that Workforce commitment is significantly related to all seven measures of performance: Customer satisfaction ($p < 0.01$); Employee morale ($p < 0.01$); Productivity ($p < 0.01$); Defects ($p < 0.01$); Delivery in full ($p < 0.01$); Warranty costs ($p < 0.01$); and Cost of quality ($p < 0.05$). Six out of seven and five out of seven measures of performance are significantly related to Customer focus and Shared vision respectively. Four performance measures are related to Co-operative supplier relations and three measures are related to Use of teams. Personnel training is related to only one measure of performance (Delivery in full on time).

	F1 Workforce commitment	F2 Shared vision	F3 Customer focus	F4 Use of teams	F5 Personnel training	F6 Co-operative supplier relations
F11_1 Customer Satisfaction	0.34**	0.21**	0.23**	0.09	-0.01	0.21**
F11_2 Employee morale	0.49**	0.25**	0.24**	0.21**	0.08	0.22**
F11_3 Productivity	0.39**	0.29**	0.20**	0.16*	0.12	0.20**
F11_4 Defects as a percentage of production volume	0.24**	0.15*	0.14*	0.03	0.03	0.03
F11_5 Delivery in Full on Time to customer	0.29**	0.25**	0.22**	0.14*	0.16**	0.30**
F11_6 Warranty claims cost as percentage of total sales	0.19**	0.08	0.07	-0.02	-0.06	0.02
F11_7 Cost of Quality as a percentage of total sales	0.15*	0.07	0.14*	-0.05	0.04	0.00

** and * significant at 0.01, and 0.05

Table 4: Correlations of element Soft TQM and measures of organisational performance

The row-wise count indicates the number of the six soft TQM elements that are affected by the performance items. Delivery in full on time is significantly related to all six elements of soft TQM. Workforce commitment, Shared vision, Customer focus, Personnel training, and Cooperative supplier relations are significant at $p < 0.01$, while Use of teams is significant at $p < 0.05$. Employee moral and Productivity measures are related to five out of six soft TQM elements, and Customer satisfaction is related to four soft TQM elements. Cost of quality and Warranty cost are related to two elements (Workforce commitment and Customer focus) and one element of soft TQM (Workforce commitment) respectively. These results support the proposition that soft TQM has direct effects on organisational performance (*H1*) and are broadly similar to the results of Samson and Terziovski (1999), Powell (1995) and Dow *et al*. (1999).

H2: Relationship between soft TQM and hard TQM

The correlation matrix in Table 5 shows the relationships between measures of soft TQM and hard TQM. The soft TQM factors such as the Workforce commitment, Shared vision and Cooperative supplier relations are each significantly related to three out of four hard TQM elements (Use of JIT principles, Technology utilisation, and Continuous improvement enablers). The other three elements such as the Customer focus, Use of teams, and Personnel training are related to two out of four hard TQM elements (Use of JIT principles and Technology utilization).

The row-wise counts of correlations show the number of soft TQM elements have an impact on hard TQM variables. Both Technology utilisation and Continuous improvement enablers are significantly related to five out of six soft TQM elements and Use of JIT principles is related to four out of six soft TQM elements. Computer based technologies has a significant correlation only with Personnel training.

	F1 Workforce commitment	F2 Shared vision	F3 Customer focus	F4 Use of teams	F5 Personnel training	F6 Co-operative supplier relations
F7 Computer based technologies	0.10	0.08	0.07	-0.07	0.16**	0.06
F8 Use of just-in-time principles	0.18**	0.14*	0.15*	0.06	0.09	0.16**
F9 Technology utilisation	0.21**	0.19**	0.27**	-0.12*	0.02	0.17**
F10 Continuous improvement enablers	0.34**	0.32**	0.12	0.24*	0.18**	0.17**

** and * significant at 0.01 and 0.05

Table 5: Correlation of elements of Soft TQM with elements of Hard TQM

H3: Relationship between hard TQM and organisational performance

The correlation between four elements of hard TQM and seven measures of organisational performance are shown in Table 6. The column-wise count reveals that Use of JIT principles affects four out of seven measures of performance: Productivity at $p < 0.01$ and Employee morale, Warranty cost, and Cost of quality at $p < 0.05$. Both Technology utilisation and Continuous improvement enablers affect three measures

while Computer based technologies affects only one measure. The row-wise count shows that three out of four elements of hard TQM affect Productivity and Cost of quality measures, while only one (Use of JIT principles) affects Warranty cost. Although it is hard to draw a direct comparison with the findings of Powell (1995) and Dow *et al*. (1999) because of the use of somewhat different dimensions of hard TQM and measures of organisational performance, it can be cautiously suggested that the findings of this study contradict with Dow *et al.* (1999) and Powell (1995). Both Dow *et al.* (1999) and Powell (1995) have found the dimensions of hard TQM to be weakly related or unrelated to performance.

	F11_1 Customer Satisfaction	F11_2 Employee moral	F11_3 Productivity performance	F12_4 Defects	F11_5 Delivery in Full on Time	F11_6 Warranty claims	F11_7 Cost of Quality
F7 Computer based technologies	-0.02	-0.03	0.00	0.06	0.00	-0.04	0.14*
F8 Use of JIT principles	0.09	0.16*	0.19**	0.12	0.10	0.13*	0.14*
F9 Technology utilisation	0.15*	0.11	0.17**	0.11	0.09	-0.04	0.16**
F10 Continuous improvement enablers	0.14*	0.08	0.16**	-0.04	0.17**	-0.03	-0.01

** and * significant at 0.01 and 0.05

Table 6: Correlation between the elements of Hard TQM and measures of organisational performance

Soft TQM	Organisational Performance	Standardised beta coefficient	*p*-value
F1 Workforce commitment	Customer satisfaction	0.31**	0.00
	Employee morale	0.51**	0.00
	Productivity	0.35**	0.00
	Defects	0.27**	0.00
	Delivery in full	0.26**	0.00
	Warranty cost	0.23**	0.00
	Cost of Quality	0.14*	0.03
F2 Shared vision	Customer satisfaction	0.17**	0.01
	Employee morale	0.23**	0.00
	Productivity	0.25**	0.00
	Defects	0.17**	0.01
	Delivery in full	0.21**	0.00
F3 Customer focus	Customer satisfaction	0.20**	0.00
	Employee morale	0.21**	0.00
	Productivity	0.15**	0.01
	Defects	0.11	0.09
	Delivery in full	0.20**	0.00
	Cost of Quality	0.09	0.16
F4 Use of teams	Employee morale	0.23**	0.00
	Productivity	0.15**	0.01
	Delivery in full	0.12*	0.05
F5 Personnel training	Delivery in full	0.15*	0.02
F6 Cooperative supplier relations	Customer satisfaction	0.17**	0.01
	Employee morale	0.18**	0.00
	Productivity	0.15*	0.02
	Delivery in full	0.28**	0.00

** and * significant at 0.01 and 0.05

Table 7: Standardised beta estimates

H4: *Indirect affects of soft TQM on organisational performance through its effect on hard TQM elements*

Hierarchical regression was used to investigate the indirect affect of soft TQM elements on performance. The relationships between soft TQM and performance measures (Table 4), and soft TQM and hard TQM elements (Table 5) were used to identify dependent and independent variables to be used in the hierarchical regression models. For example, Personnel training is correlated with two hard TQM elements: Computer based technologies and Continuous improvement enablers (see Table 5), and one measure of performance: Delivery in full on time (see Table 4). However, Table 6 shows that Continuous improvement enablers does actually has a correlation with Delivery in full on time of 0.17 (significant at $p < 0.01$). A hierarchical regression was therefore run with Delivery in full on time as the dependent variable, and Computer based technologies and Continuous improvement enablers as the independent variables, followed by Personnel training as the final independent variable. The standardised partial beta estimate for Personnel training was 0.15, which is significantly greater than

zero at p = 0.02 (see Table 7). Thus, there is a direct effect of Personnel training on Delivery in full which is indicated by 'x' in Table 8. Note that Table 8 has 'NE' (not exist) for 'direct effects' under all columns except Delivery in full, since analysis was conducted only for one dependent variable significant in Table 4. 'NS' denotes tests for direct effects that were not significant. Similar regression analyses were undertaken for the other elements of soft TQM.

		F11_1 Customer Satisfaction	F11_2 Employee moral	F11_3 Productivity performance	F11_4 Defects	F11_5 Delivery in Full on Time	F11_6 Warranty claims	F11_7 Cost of Quality
F1 Workforce commitment	F8 Use of JIT principles		X	X			X	X
	F9 Technology utilisation	X		X				X
	F10 Cont. improvement enablers	X		X		X		
	Direct Effects	X	X	X	X	X	X	X
F2 Shared vision	F8 Use of JIT principles		X	X			X	X
	F9 Technology utilisation	X		X				X
	F10 Cont. improvement enablers	X		X		X		
	Direct Effects	X	X	X	X	X	NE	NE
F3 Customer focus	F8 Use of JIT principles		X	X			X	X
	F9 Technology utilisation	X		X				X
	Direct Effects	X	X	X	NS	X	NE	NS
F4 Use of teams	F9 Technology utilisation	X		X				X
	F10 Cont. improvement enablers	X		X		X		
	Direct Effects	NE	X	X	NE	X	NE	NE
F5 Personnel training	F7 Computer based technologies							X
	F10 Cont. improvement enablers	X		X		X		
	Direct Effects	NE	NE	NE	NE	X	NE	NE
F6 Co-operative supplier relations	F8 Use of JIT principles		X	X			X	X
	F9 Technology utilisation	X		X				X
	F10 Cont. improvement enablers	X		X		X		
	Direct Effects	X	X	X	NE	X	NE	NE

x = Significant at 0.01 or 0.05

Table 8: Direct and indirect effects of soft TQM elements on organisational performance

For Workforce commitment seven regression models were run with each performance measure used as a dependent variable (ie, the seven significant correlations shown in Table 4). The independent variables were Use of JIT principles, Technology utilisation, and Continuous improvement enablers (the three significant in Table 5), followed by Workforce commitment. The standardized partial beta estimates for all measures of performance were significantly greater than zero (Customer satisfaction: 0.31 at p = 0.00; Employee morale: 0.51 at p = 0.00; Productivity: 0.35 at p = 0.00; Defects: 0.27 at p = 0.00; Delivery in full: 0.26 at p = 0.00; Warranty cost: 0.23 at p = 0.00; and Cost of quality: 0.14 at p = 0.03). These direct effects of Workforce commitment on performance measures are shown by 'x' in Table 7.

Six regression models were run using Customer focus as the independent variable. Using Customer satisfaction as the dependent variable, the standardized partial beta was 0.20 (p = 0.00), with Employee morale, it was 0.21 (p = 0.00), with Productivity, it was 0.15 (p = 0.01), and with Delivery in full, it was 0.20 (p = 0.00). However, for Customer focus, with Defects and Cost of quality, the standardized partial beta estimates were 0.11 (p = 0.09) and 0.09 (p = 0.16) respectively. Thus, Customer focus directly effects Customer satisfaction, Employee morale, Productivity, and Delivery in full and indirectly affects Defects, and Cost of quality.

Four significant correlations exit between Cooperative supplier relations and measures of performance (Table 4). Thus four regression models were run with each performance measure used as a dependent variable. The independent variables were Use of JIT principles, Technology utilisation, and Continuous improvement enablers (the three significant in Table 5), followed by Cooperative supplier relations. The results showed that the standardized partial betas for the four performance measures were significantly greater than zero (Customer satisfaction: 0.17 at p = 0.01; Employee morale: 0.18 at p = 0.00; Productivity: 0.15 at p = 0.02 and Delivery in full: 0.28 at p = 0.00). These direct effects of Cooperative supplier relations on performance are shown by 'x' in Table 7. The standardized partial beta estimates of Shared vision, and Use of teams are shown in Table 7 and their direct effects are indicated by 'x' in Table 8. The regression models run using these items as independent variables identified additional direct effects.

Discussion

The results of this study suggest that in general, the elements of soft TQM are significantly related to the measures of organizational performance. Five out of six soft TQM elements have positive relationship with organizational performance. These are Workforce commitment, Shared vision, Customer focus, Use of teams, and Cooperative supplier relations. These findings are consistent with the results of Powell (1995) and Dow *et al*. (1999). However, both Powell (1995) and Dow *et al.*(1999) did not find significant relationship between Cooperative supplier relations and performance, and suggested that it could be context-dependent. In other words, a factor such as cooperative supplier relations could be more relevant for manufacturing firms than for service organizations.

Three out of four elements of hard TQM such as Use of JIT principles, Technology utilization, and Continuous improvement enablers have significant relationships with all six soft TQM elements which supports H2. This suggests that organizations must have appropriate soft TQM elements in place to create conditions that allow effective

diffusion and utilization of hard TQM elements. These results also suggest that four out of seven measures of performance are positively related to Use of JIT principles, and three out seven measures are related to both Technology utilization and Continuous improvement enablers. These findings contradict the results of Powell (1999), Dow *et al*. (1999) and Samson and Terziovski (1999) who found no significant relationship between hard TQM elements and organizational performance. Dow et al. (1999) argues that non-significant relationship between hard TQM and performance are influenced to some extent by their narrow definition of organizational performance and suggested the inclusion of productivity and flexibility as measures of performance. Considering productivity as a performance measure this study revealed a significant positive relationship between Use of JIT principles and productivity. Four out of six soft TQM elements (Workforce commitment, Shared vision, Customer focus and Co-operative supplier relations) affects Use of JIT principles which in turn affects Productivity.

There are several other patterns that can be observed from the results of this study. In addition to having a direct impact of soft TQM elements on performance, soft TQM indirectly affects performance through hard TQM elements. This finding supports H4. The patterns are;

- Soft TQM elements affect Continuous improvement enablers, which in turn affects three measures of performance such as Customer satisfaction, Productivity, and Delivery in full on time. This pattern of direct impact on Continuous improvement enablers and indirect impact on three measures of performance was observed for five of the six soft TQM elements. This pattern was observed for all performance measure except Customer focus.

- Workforce commitment, Shared vision, and Cooperative supplier relations affect three out of four hard TQM elements (Use of JIT principles, Technology utilization, and Continuous improvement enablers), each one of these in turn affects the Productivity performance measure.

- Elements of soft TQM affect Use of JIT principles, which in turn affects Employee morale, Productivity, Warranty cost, and Cost of Quality. This impact was observed for four of the six elements of soft TQM. Only exceptions are Use of teams and Personnel training.

- Four elements such as Workforce commitment, Shared vision, Customer focus, and Cooperative supplier relations have direct impact on Use of JIT principles and Technology utilization which in turn affect Cost of quality.

In summary, this research makes contributions for both quality management researchers and practicing managers. For researchers it provides an alternative methodology to assess not only the direct impacts of soft and hard TQM on performance but also the indirect impact of soft TQM on performance through hard TQM elements. The idea of the use of alternative methodologies for further research in quality management has recently been suggested by Powell (1995). For practicing managers this study, like the studies by Dow et al. (1999), Powell (1995) and Samson and Terziovski (1999), suggests that majority of the soft TQM elements affects organizational performance. In addition, this study provides evidence that certain hard TQM elements significantly

effects performance and suggests that for hard TQM to impact performance, it is essential that such hard elements are supported by the elements of soft TQM.

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