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Soft TQM, hard TQM, and organisational performance relationships: an empirical investigation

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Abstract

TQM literature suggests that hard TQM has a profound impact on organisational performance. However, most empirical studies have examined 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, and then assess the direct impact of hard TQM on performance. Analysis of 261 Australian manufacturing companies revealed significant positive relationships between soft TQM and hard TQM elements. In addition to direct affects, soft TQM also has an indirect affect on performance through its effect on hard TQM.

Keywords: Total quality management (TQM); Hard TQM; Soft TQM; Organisational performance; Australian Manufacturing Council (AMC)

1. Literature review and hypotheses

Empirical studies which have examined the relationship between total quality management (TQM) and organisational performance have investigated the impact of each dimension of TQM on performance separately [1–4], as illustrated in Fig. 1. These studies have indicated that only a handful of the soft aspects of TQM (i.e., 'human factors' like commitment, team work and so on) contribute to organisational performance. Our contention is that soft TQM actually plays a number of 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 organisation [5]. 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 shown in Fig. 2. Other researchers who support our contention are Hart and Schlesinger [6], Bowen and Lawler [7] and Kochan et al. [8]. According to Kochan et al. [8], TQM can be viewed in one of two ways. The first approach conceptualises TQM as a limited set of technical tools (such as statistical process control and Pareto analysis) while the second approach views TQM as part of broader changes to human resource (HR) practices. Through examining computer, automotive, health care and banking industries in four countries, they found that the use of hard TQM tools tends to be more profound in companies that adopt strategies to increase stakeholder commitment and incorporate the views of employees in decision making processes. Fig. 2 hypothesises that soft TQM will affect elements of hard TQM, in addition to having a direct impact on performance. For simplicity, this does not show all direct and indirect paths expressed by the model. In this paper, we look at the six elements of soft TQM examined by Dow et al. [2] and the four elements of hard TQM adopted by Power et al. [9]. Organisational performance is expressed in the seven

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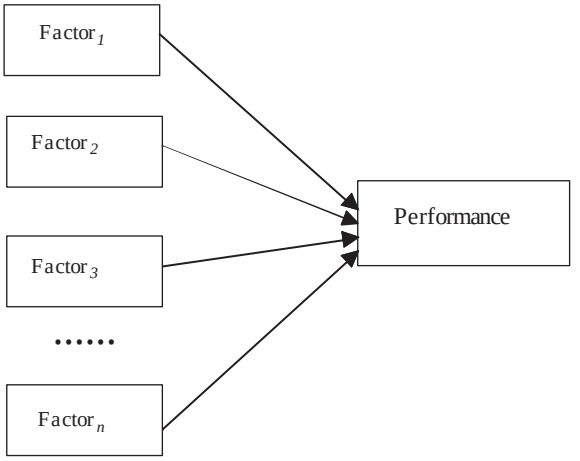

Fig. 1. Effects of the elements of TQM on performance as individual factors.

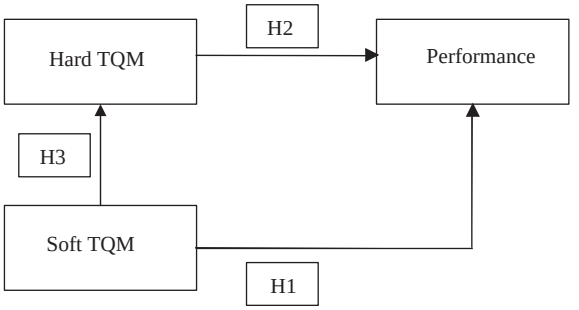

Fig. 2. Proposed model: effects of soft and hard TQM on performance.

variables used by Samson and Terziovski [3]. These items are discussed in greater detail in the following sections.

1.1. Soft TQM and organisational performance

Powell [1] found that only three of his 12 soft TQM factors (executive commitment, open organisation, and employee empowerment) were significantly correlated with overall corporate performance. Through a study of Australian manufacturing companies, Dow et al. [2] also found that out of a total of nine factors, only the three items of workforce commitment, shared vision, and customer focus had a significant positive association with quality and performance. Ahire et al. [5] reached a similar conclusion in their study of automobile manufacturing and component companies in the US, and found that performance (in terms of product quality) was highly correlated with elements of soft TQM, such as employee empowerment, employee training and employee involvement. However, these studies adopted different sets of indicators as measures of performance. For instance, Dow et al. [2] and Ahire et al. [5] adopted relatively narrow, quality focused definitions of performance, while Powell [1] used a variety of specific measures of TQM performance. Table 1 compares the specific performance measures used by Powell [1] and Dow et al. [2] with the more broad measures adopted in this study.

Table 1
Measures of organisational performance adopted in selected studies

Study	Item
Powell (1995)	1. Financial performance (over past 3 years) 2. Financial performance relative to competitors (over past 3 years) 3. Revenue growth (over past 3 years) 4. Profitability relative to competitors (over past 3 years) 5. Revenue growth relative to competitors (over past 3 years) 6. Quality program has increased productivity 7. Quality program has improved competitive position 8. Quality program has increased profitability 9. Quality program has increased sales 10. Quality program has improved overall performance 11. Quality program has been positive development for organisation 12. Quality program has had a negative impact on profitability 13. Organisation would be better off without quality program
Dow et al. (1999)	1. Finished product defect rate relative to major competitors 2. Defects as a percentage of production volume 3. Warranty claims cost as percentage of total sales 4. Cost of quality as a percentage of total sales
This study	1. Customer satisfaction 2. Employee morale 3. Productivity 4. Defects as a percentage of production volume 5. Delivery in full on time to customer 6. Warranty claims cost as percentage of total sales 7. Cost of quality as a percentage of total sales

Elements of soft TQM are essentially dimensions of HRM. The coverage of soft TQM in the management literature is extensive and the prescriptions offered in management and TQM literature are very similar. Dean and Bowen [10] suggest that three out of six criteria of the Malcolm Baldridge National Quality Award (MBNQA) framework are extensively covered in the management literature. The three criteria, leadership, HRM and strategic quality planning, are all elements of soft TQM. Powell [1] concluded

that 'organisations that acquire 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.

1.2. Hard TQM and organisational performance

Sitkin et al. [11] suggested that the common guiding principles of TQM can be grouped into three areas: (1) those focusing on customer satisfaction, (2) those stressing continuous improvement, and (3) those that treat organisations as total systems. Hard TQM has a strong relationship with 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? Powell [1], Dow et al. [2] and Ahire et al. [5] found that measures of statistical process control (SPC), the use of benchmarking, and flexible manufacturing systems were not related to performance. Despite this, management literature suggests that 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 [12,13]. Other examples include the impact of six sigma processes at Motorola and other companies [13], QFD in Toyota [14], seven simple tools in Honda [15], SPC in Motorola [16] and Taguchi methods in Mazda and Ford [17]. These studies suggest that:

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

1.3. Soft TQM and hard TQM

While top management acts as a driving force for TQM, managerial commitment needs to be translated into specific strategies. Companies can achieve superior organisational performance by designing quality into products and services, assuring in-process quality through the use of defect prevention methods and control tools, as well as through judicious use of quality information such as customer feedback, benchmarking and charts [5]. To implement these strategies successfully, organisations have to be customer focused, maintain competent, reliable and flexible suppliers, and promote employee participation in decision making processes through training and empowerment [5]. It is important to note that upgrading technology and promoting hard TQM practices may not necessarily increase competitive advantage. Attention to process, product and information technology may yield quality improvements, but ultimately it is 'people that make quality happen' [7]. Executives appear to understand that employee motivation and education and corporate culture all have an important role to play in efforts to improve quality, even if they are uncertain about how HR-based quality improvements can be implemented in practice [6,7]. There is evidence to suggest that successful organisations are those that apply a combination of hard and soft TQM policies to respond to changing customer requirements. Under-performing companies, on the other hand, tend to see technology as a way to improve operational outcomes rather than customer satisfaction [9]. This is supported by Ahire et al. [5] who found that quality management strategies tend to act in synergy to affect product quality and require effective human resource utilisation, while also incorporating suppliers. In a study of companies based in the US, Japan, Canada and Germany, Kochan et al. [8] concluded that quality needs to be viewed not as a limited set technical engineering changes, but as part of broader strategy of a organisational change. Kochan et al. [8] also found evidence to suggest that the best quality systems are those that engage employees and are embedded within a team-based HR system. 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 of soft TQM, the indirect effects may be negative, even when the direct effects of soft TQM are positive.

2. Methodology

In this section we discuss the sample selection process, the operational measures of variables used in the study, and the statistical tests used to evaluate the hypotheses.

2.1. Sample

This study uses data collected from a survey of manufacturing companies in Australia and New Zealand undertaken by the Australian Manufacturing Council (AMC) [18] in 1994. Some of the major studies that have investigated the relationship between TQM practices and organisational performance have also utilised this data set [2,3]. Because 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, it was decided to use the same data set for 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 after the main survey, and no evidence of non-response bias was found [19]. Since the survey instrument consisted of a large number of questions (a total of 260), the results of the survey were also tested for respondent fatigue. It was found that the length and complexity of the survey instrument did not seriously effect the quality of the responses [19].

Table 2
Breakdown of samples by industry type

Industry subdivision	Percent of companies	
	962 sample	261 sample
Fabricated metal products	12.6	16.1
Chemical, petroleum	12.3	8.0
Miscellaneous manufacturing	11.3	11.5
Basic metal products	8.4	7.7
Non-metallic mineral products	8.1	6.1
Other machinery	7.9	10.3
Wood, wood products	7.1	5.7
Food and Beverage	7.0	3.1
Transport equipment	7.0	14.6
Clothing and footwear	6.5	7.7
Textiles	5.7	6.5
Paper, paper products	5.6	1.9
Not answered	0.5	0.8
Total	100.0	100.0

Table 3
Breakdown of samples by company size

Company size	Percent of companies	
	962 sample	261 sample
1–19	2.4	0.4
20–49	23.4	13.8
50–99	26.8	19.2
100 or more	43.7	64.4
Not answered	3.7	2.3
Total	100.0	100.0

Close examination of the data set revealed an excessive number of unanswered questions in relation to 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. The remaining non-valid responses for the hard TQM items were in-filled using group means. This is one of several methods that can be used to handle missing item values in Likert-type measures [20,21]. This produced a total of 261 companies from the original data set of 962. Tables 2 and 3 show a breakdown of the original 962 sample and the 261 sub-sample by industry type and company size. Compared to the original sample, fabricated metal products, other machinery and transport equipment companies appear to be slightly over-represented, while there is some under-representation of companies in chemical/petroleum, food and beverage and paper/paper products industries. In terms of industry size, the 261 sample has a greater representation of larger companies compared with the original sample. Overall however, the 261 sample appears to be reasonably representative of the original group of companies. Because there were less than 10 companies in some industry groups, it was decided that it would not be worthwhile to examine differences in responses according to industry type. This represents a shortcoming of the study, and is suggested as an area for future research.

2.2. Operational dimensions of soft TQM

Soft TQM dimensions were adopted from a study by Dow et al. [2]. As shown in Table 4, a total of 25 items were identified as being representative of soft TQM practices. These items were grouped into six elements (scales) and coefficient alpha values 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 4). The alpha values indicate that each dimension is a sufficiently reliable measure [22].

2.3. Operational dimensions of hard TQM

The items used by Dow et al. [2] to identify hard TQM practices were considered to be too narrow for the purposes of this study. Hard TQM items were therefore adopted from a study by Power et al. [9]. These items are shown in Table 5. A total of 13 items were identified as indicators of hard TQM practices. These items were grouped into four elements and coefficient alpha values were calculated. The values ranged between 0.55 (Technology utilisation) and 0.86 (Computer-based technologies) (Table 5). 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.

2.4. Operational measures of organisational performance

The items related to organisational performance were adopted from Samson and Terziovski [3]. This construct consists of seven items and was considered to be more comprehensive than the four items used in the study by Dow et al. [2]. These items are shown in Table 6.

2.5. Methods used to evaluate hypotheses

Simple regression analysis was used to evaluate H1–H3 and hierarchical regression was used to evaluate H4. The relationship between each of the soft TQM elements and the measures of organisational performance was investigated after controlling for the effect of hard TQM on organisational performance. The analysis of standardised partial beta estimates from hierarchical regression took into account (1) the direct effect that soft TQM elements have on either hard TQM elements or measures of organisational performance (or both); and (2) the indirect effects that soft TQM elements have on organisational performance through elements of hard TQM.

Table 4
Items of the soft TQM dimensions

Element	Mean	Std. dev.	Item	Factor loading	Alpha score
F1: Workforce commitment	3.81	0.54	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	3.74	0.58	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	3.55	0.84	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	2.52	1.28	1. Proportion of production operators in quality 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	2.44	0.56	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: Cooperative supplier relations	3.41	0.72	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	

3. Results

3.1. H1: Relationship between soft TQM and organisational performance

The correlation between the six elements of soft TQM and the seven measures of organisational performance are shown in Table 7. The results can be analysed in two ways: the column-wise and row-wise count of correlation coefficients. The column-wise counts shows the degree to which the seven measures of performance are affected by each element of soft TQM. The correlation matrix shows 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 on time ($p < 0.01$); Warranty costs ($p < 0.01$); and Cost of quality ($p < 0.05$). Six out of seven and five out of seven measures of performance

Table 5
Items of the hard TQM dimensions

Element	Mean	Std. dev.	Item	Factor loading	Alpha score
F7: Computer based technologies	3.59	0.50	1. Extent of contribution to competitive position: computer-aided design (CAD) and/or computer engineering	0.73	0.86
			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	
			4. Extent of contribution to competitive position: local area 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 (JIT) principles	3.50	0.87	1. Contribution of just-in-time to factory operations	0.79	0.74
			2. Extent of contribution to competitive position: just-in-time	0.79	
F9: Technology utilisation	3.64	0.79	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 our manufacturing technology to its maximum potential	0.72	
F10: Continuous improvement enablers	3.64	0.58	1. Extent of contribution to competitive position: flexible manufacturing cells (FMC) or systems (FMS)	0.54	0.68
			2. Extent of contribution to competitive position: statistical process control (SPC)	0.59	
			3. Extent of contribution to competitive position: value adding management (VAM)	0.77	

Table 6
Items related to organisational performance

Element	Mean	Std. dev.	Item	Factor loading	Alpha score
F11: Organisational performance	2.94	0.80	1. Customer satisfaction	0.68	0.67
	3.31	0.69	2. Employee morale	0.60	
	3.62	0.75	3. Productivity	0.52	
	3.12	1.25	4. Defects as a percentage of production volume	0.62	
	3.78	1.11	5. Delivery in full on time to customer	0.55	
	4.11	1.04	6. Warranty claims cost as percentage of total sales	0.46	
	3.94	0.94	7. Cost of quality as a percentage of total sales	0.57	

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).

The row-wise counts show the number of soft TQM elements that are affected by the performance items. Delivery in full 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

Table 7
Correlations of elements of soft TQM and measures of organisational performance

	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 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 percentage of total sales	0.15*	0.07	0.14*	−0.05	0.04	0.00

*Significant at 0.05.
**Significant at 0.01.

soft TQM has direct effects on organisational performance (H1) and are broadly similar to the findings of Samson and Terziovski [3], Powell [1] and Dow et al. [2].

3.2. H2: Relationship between soft TQM and hard TQM

The correlation matrix in Table 8 shows the relationships between measures of soft TQM and hard TQM. The soft TQM factors of 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 remaining three elements (Customer focus, Use of teams, and Personnel training) are related to two out of four hard TQM elements (Use of JIT principles and Technology utilisation).

The row-wise counts of correlations show the number of soft TQM elements that 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.

3.3. 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 9. The row-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 column-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 [1] and Dow et al. [2] 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 those of Dow et al. [2] and Powell [1]. Both Dow et al. [2] and Powell [1] have found the dimensions of hard TQM to be weakly related or unrelated to performance.

3.4. 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 7), and soft TQM and hard TQM elements (Table 8) were examined to identify dependent and independent variables to be used in the hierarchical regression models. For example, Personnel training was correlated with two hard TQM elements (Computer-based technologies and

Table 8
Correlation of elements of soft TQM with elements of hard TQM

	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 JIT 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	0.36**	0.34**	0.15	0.24*	0.21**	0.17**

*Significant at 0.05.
**Significant at 0.01.

Table 9
Correlation between the elements of hard TQM and measures of organisational performance

	F11_1 Customer satisfaction	F11_2 Employee moral	F11_3 Productivity performance	F12_4 Defects 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 improvements enablers	0.15*	0.08	0.18**	0.06	0.17**	0.02	−0.01

*Significant at 0.05.
**Significant at 0.01.

Continuous improvement enablers, see Table 8), and one measure of performance (Delivery in full, see Table 7). However, Table 9 shows a correlation between Continuous improvement enablers and Delivery in full of 0.17 (significant at $p < 0.01$). A hierarchical regression was therefore run with Delivery in full as the dependent variable, 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 10). Thus, there is a direct effect of Personnel training on Delivery in full which is indicated by × in Table 11. Note that Table 11 shows no direct effects ('NE', non-existent) under all columns except Delivery in full, because analysis was conducted only for one significant dependent variable in Table 7. 'NS' denotes tests for direct effects that were not significant. Similar regression analyses were undertaken for the other elements of soft TQM.

For Workforce commitment, seven regression models were run using each performance measure as a dependent variable (i.e., the seven significant correlations shown in Table 7). The independent variables were Use of JIT principles, Technology utilisation, and Continuous improvement enablers (the three significant in Table 8), followed by Workforce commitment. The standardised 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 '×' in Table 11.

Table 10
Standardised beta estimates

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

*Significant at 0.05.
**Significant at 0.01.

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

Four significant correlations exit between Cooperative supplier relations and measures of performance (Table 7). Four regression models were therefore 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 8), followed by Cooperative supplier relations. The results showed that the standardised 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 $p = 0.00$). The direct effects of Cooperative supplier relations on performance are shown by '×' in Table 11. The standardised partial beta estimates of Shared vision, and Use of teams are shown in Table 10 and their direct effects are indicated by '×' in Table 11. The regression models run using these items as independent variables identified additional direct effects.

4. Discussion and conclusion

The results of this study suggest that in general, the elements of soft TQM are significantly related to the measures of organisational performance. Five out of six soft TQM elements have a positive relationship with organisational 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 [1] and Dow et al. [2]. However, both Powell [1] and Dow et al. [2] 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 organisations.

Three out of four elements of hard TQM—Use of JIT principles, Technology utilisation, and Continuous improvement enablers—have significant relationships with all six soft TQM elements, which supports H2. This provides evidence to suggest that organisations must have appropriate soft TQM elements in place to create conditions that allow effective diffusion and utilisation 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 utilisation and Continuous improvement enablers. These findings contradict the results of Powell [1], Dow et al. [2] and Samson and Terziovski [3] who found no significant relationship between hard TQM elements and organisational performance. Dow et al. [1] argued that non-significant relationships between hard TQM and performance were probably influenced by their narrow definition of organisational performance, and suggested that productivity and flexibility should be included in a broader definition of performance. 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) were found to affect Use of JIT principles, which in turn affected Productivity. It is important to point out that in a few cases, despite the significant correlations, standardised

Table 11
Direct and indirect effects of soft TQM elements on organisational performance

		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		×	×			×	×
	F9 Technology utilisation	×		×				×
	F10 Cont. Improvement enablers	×		×		×		
	Direct effects	×	×	×	×	×	×	×
F2 Shared vision	F8 Use of JIT principles		×	×			×	×
	F9 Technology utilisation	×		×				×
	F10 Cont. Improvement enablers	×		×		×		
	Direct effects	×	×	×	×	×	NE	NE
F3 Customer focus	F8 Use of JIT principles		×	×			×	×
	F9 Technology utilisation	×		×				×
	Direct effects	×	×	×	NS	×	NE	NS
F4 Use of teams	F9 Technology utilisation	×		×				×
	F10 Cont. Improvement enablers	×		×		×		
	Direct effects	NE	×	×	NE	×	NE	NE
F5 Personnel training	F7 Computer-based technologies							×
	F10 Cont. Improvement enablers	×		×		×		
	Direct effects	NE	NE	NE	NE	×	NE	NE
F6 Co-operative supplier relations	F8 Use of JIT principles		×	×			×	×
	F9 Technology utilisation	×		×				×
	F10 Cont. Improvement enablers	×		×		×		
	Direct effects	×	×	×	NE	×	NE	NE

×= Significant at 0.01 or 0.05; NE=non-existent; NS=non-significant.

beta coefficients were found to be insignificant. For instance, performance measures such as Defects and Cost of quality are significantly correlated with customer focus (both at $p < 0.05$, Table 8). However, beta coefficients for Defects (0.11), Cost of quality (0.09) (Table 10) were found to be insignificant. Thus, there is some evidence to suggest that Customer focus only has an indirect effect on Defects and Cost of quality.

A number of other relationships were found in this study. In addition to the direct impact of soft TQM elements on performance, soft TQM indirectly affects performance through hard TQM elements. This finding supports H4. More specifically, it was found that:

- Soft TQM elements affect Continuous improvement enablers, which in turn affects three measures of performance such as Customer satisfaction, Productivity, and Delivery in full. 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 measures with the exception of Customer focus.
- Workforce commitment, Shared vision, and Cooperative supplier relations affect three out of four hard TQM elements (Use of JIT principles, Technology utilisation, 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 was observed for four of the six elements of soft TQM, with the exception of Use of teams and Personnel training.
- Workforce commitment, Shared vision, Customer focus, and Cooperative supplier relations have a direct impact on Use of JIT principles and Technology utilisation which in turn affects Cost of quality.

The main findings of this research are relevant to both quality management researchers and practicing managers. For researchers the paper presents an alternative methodology to assess not only the direct impacts of soft and hard TQM on performance, but the indirect impact of soft TQM on performance via hard TQM elements. This corresponds to calls made by Powell [1] for the use of alternative

methodologies in research on quality management. For practicing managers, this study, like those of Dow et al. [2], Powell [1] and Samson and Terziovski [3], suggests that soft TQM elements affect organisational performance. In addition, this study provides evidence that certain hard TQM elements have a significant effect on 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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