



QFD, organisational creativity and productivity

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John D. Politis

*Pioneering Faculty of Business Programs, Higher Colleges of Technology,
Dubai, United Arab Emirates*

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Abstract

Purpose – This paper examines the relationship between organisational creativity, productivity and the underlying dimensions that foster quality function deployment (QFD).

Methodology – A total of 359 usable questionnaires were received from employees who are engaged in quality management programmes from nine companies in the United Arab Emirates (UAE). These were subjected to a series of correlational and regression analyses.

Findings – There are three major findings in this research. First, the relationship between the QFD variables and organisational creativity is positive and significant. Second, the relationship between the QFD variables and productivity is stronger compared with the relationship between the QFD variables and organisational creativity.

Practical implications – Finally, the study suggests that top management commitment, worker-supervisor collaboration in QFD efforts, internal processes and strategies for QFD, the effectiveness of use of information and data to support QFD actions, and building relationships with customers, are essential in creating an organisational climate conducive to QFD implementation. The study shows that the real challenge for organisations in the UAE is to create a working environment that facilitates the process of QFD.

Keywords Creative thinking, Quality function deployment, Productivity rate, Innovation, United Arab Emirates

Paper type Research paper

1. Introduction

The competitiveness of an organisation depends on its ability to continuously adapt to new environments, develop new products, and create innovative ideas (Kay, 1993; Martensen and Dahlgaard, 1999). But how? Many organisations have reached the conclusion that total quality management (TQM) is essential in the process of achieving sustained organisational competitive advantage in the new economy. It is reported that TQM is a paradigm and a philosophy (Haag *et al.*, 1996) that comprises three primary activities, namely:

- (1) *hoshin* planning;
- (2) quality function deployment (QFD); and
- (3) statistical process control (SPC).

Yet, QFD appears to be the key tool in every conceptual TQM model proposed today (Besterfield *et al.*, 1999).

According to Akao (1990), QFD is:

... a method for developing a design quality aimed at satisfying the consumer and then translating the consumer's demands into design targets and major quality assurance points to be used throughout the production phase.



In other words, QFD is a pointed way of listening to customers to learn exactly what they want, and then using a logical system (i.e. vehicle) to determine how best to fulfil those needs with available resources. It is a team builder – it ensures that everyone works together to give customers what they want (Guinta and Praizler, 1993). It gives everyone in the organisation a road map showing every step, from design through to delivery, and interacts to fulfil customer requirements.

Moreover, it is widely recognised that QFD has enabled a variety of organisations to deliver dramatic performance improvements through transforming customer requirements into appropriate products or services (Mitra, 1998; Sullivan, 1986). Although the literature suggests that QFD is cited as the most widespread implementation of TQM (Sage, 1992), and ultimately reduces development time and increases market share and profitability (Menon *et al.*, 1994; Prasad, 1996), there are no studies that have examined empirically the relationship between the underlying dimensions conducive to QFD implementation and performance improvements.

Current research lacks empirical evidence supporting the role played by the work environment in the course of QFD, as applied under the continuous improvement process (i.e. *kaizen* philosophy). Specifically, there is no empirical evidence assessing the effect of worker-supervisor collaboration in QFD efforts and top management's support of and commitment to TQM. After all, QFD is the implementation vehicle for TQM, and its power and success lies in top management's commitment and support, the availability of human resources, and the use of information and data to support QFD actions. Thus, there is an interest from academics and practitioners in addressing the underlying variables that facilitate QFD implementation.

The goal of this study is to examine empirically the relationship between creativity, productivity and the specific determinants conducive to the QFD process. The study involves a questionnaire-based survey of employees who are engaged in quality management programs from large organisations in the United Arab Emirates.

2. Work outcomes

Work outcome or organisational performance is of considerable importance for quality of life, for national economies and for increasing organisational competitiveness in the rapidly changing global economy. Due to its importance, the concept of measuring performance has received a great deal of scientific attention in the last 20 years (Cohen and Bailey, 1997). Over the years, organisational performance has been used to evaluate and compare:

- different leadership styles (Stogdill, 1974; Misumi, 1985; Cohen *et al.*, 1996);
- different types of organisational structures (Farris, 1969; Barefield and Young, 1988);
- different types of manufacturing practices (Hiromoto, 1988; Kaplan, 1990; Young, 1992);
- different training and modelling techniques (Bandura, 1977; Manz, 1986; Manz and Sims, 1981, 1986); and
- different theories of motivation, creativity, the contributions of individual or organisational groups and a myriad other social phenomena.

With so many different approaches to work performance to pin down, what is important to measure in an organisation is difficult to determine. It is even more difficult to measure performance in organisations with active QFD and continuous improvement programs. In these organisations, performance measures should be able to gauge the outcomes of creative individuals. Amabile *et al.* (1996) have established two dimensions of work outcome – creativity and productivity – which fit into the broader framework of TQM, *kaizen*, and QFD. “Creativity” refers to “a creative organisation or unit, where a great deal of creativity is called for and where people believe they actually produce creative work”, while “productivity” refers to “an efficient, effective and productive organisation or unit” (Amabile *et al.*, 1996, p. 1166).

Amabile *et al.* (1996) have drawn on the literature of creativity and developed an instrument which assesses organisational creativity, productivity and the dimensions of the work environment that were found in empirical research and theory as essential for organisational creativity. This research instrument is referred to in the literature as “KEYS”: it contains 78 items, and can be found in Amabile’s KEYS User’s Manual (Amabile, 1995). Of the 78 items, 12 gauge the respondents’ perceptions of work performance (i.e. organisational creativity and productivity) of the work being carried out in their teams, and the remaining 66 describe the work environment. All items for creativity and productivity are written as simple descriptive statements of the work. In order to avoid response bias, some items were worded positively and some were worded negatively. A typical item for creativity was “a great deal of creativity is called for in my daily work”, while an item for productivity was “my area of this organisation is effective”. Amabile *et al.*’s scales of organisational creativity and productivity were included in the research model of this study.

3. Determinants of quality function deployment

Quality function deployment (QFD) is a literal translation of the Japanese words *hinshitsu kino tenkai* (Akao *et al.*, 1983). QFD was developed by Akao and Mizuno in Japan in 1966. By 1972 the power of the approach had been well demonstrated at the Mitsubishi Heavy Industries Kobe Shipyard (Sullivan, 1986), and in 1978 the first book on the subject was published in Japanese, and was later translated into English in 1994 (Mizuno and Akao, 1994).

In Akao’s words:

... QFD is a way to assure the design quality while the product is still in the design stage.

As a very important side benefit, he points out that when appropriately applied, QFD has demonstrated the reduction of development time by one-half to one-third (Akao, 1990). Due to its superb performance improvements, QFD has been successfully used in a wide variety of organisations (Menon *et al.*, 1994), and it is deeply integrated into our commercial industry culture (Wollover, 1997). While QFD is by far the most highly developed form of integrated product and process development in existence (Zaim and Sevkli, 2002), it is difficult to understand what stimulates or hinders the success of QFD implementation (Day, 1993). Yet, there is a general consensus that organisations with employees acquiring customer focused thinking will be able to accomplish future challenges (Akao, 1995), and QFD will serve as a *tool* for achieving these challenges through aligning company-wide activities to customer focus.

A review of the literature indicates that it is rather difficult to identify a *quality tool* that has the ability to both determine what will satisfy the customer, and translate those

customer desires into the target product or service (Mizuno, 1988; Mazur, 1992). As a result, where should organisations begin? What are the environmental variables that facilitate QFD practices? How do organisations assess those underlying dimensions that advance QFD implementation? Politis (2003) has drawn on the literature of TQM and QFD and developed scales which assess that dimensions of the work environment that have been suggested in theory and practice as being essential to QFD implementation. These scales are referred to in the literature as the “QFD methodologies or determinants”.

Seven determinants conducive to QFD implementation are measured by Politis’s QFD instrument. Their definitions have been adopted from Politis (2003 pp. 181-2):

- *QFD strategic planning*, so that the company sets strategic directions and action plans to support QFD methodologies;
- *customer and market focus*, so that the company determines customer requirements, expectations and builds customer relationships for their satisfaction;
- *QFD information and analysis*, so that the company selects information systems that support strategic planning;
- *human resources focus on QFD*, so that the company enables employees to develop and utilise their full potential to effectively deliver value to the customer;
- *top management commitment to QFD*, so that management demonstrates its commitment to QFD by providing human and capital resources;
- *QFD training to supervisors*, so that there is a breakdown of barriers between ranks, and participation exists between supervisors and other levels to enhance the quality of training and quality efforts; and
- *worker-supervisor collaboration in QFD efforts*, so that there is a collaboration between workers and supervisors to solve quality problems.

The various items of the above constructs are listed in Politis’s (2003 pp. 191-2) study.

Although there is no direct evidence suggesting a relationship between the above QFD constructs and the dimensions of creativity and productivity, it is suggested that organisations need to create a supportive working environment that encourages employees’ creative thinking and idea generation (Amabile, 1998; Eyton, 1996; Goldsmith, 1996). In other words, for employees to be creative and innovative, there must be a work environment that supports QFD implementation. Moreover, there is extensive literature that indicates that organisations using QFD practices exhibit cost reductions, project time reductions (Guinta and Praizler, 1993), reductions in new model development costs and reductions in development time (Menon *et al.*, 1994; Prasad, 1996). Moreover, in a number of real life case studies it was found that QFD inspires commitment and creativity in its delivery. For example, Smith and Nephew Group Research Centre (2003) claim that QFD enabled them to develop the metaprocesses to stimulate an increase in creativity and innovation. It is thus reasonable to assume that the factors of QFD, as established by Politis (2003), will be positively correlated with the factors of creativity and productivity. The assumed connectedness between the determinants fostering QFD and the dimensions of creativity and productivity is expressed in the following hypotheses:

- H1.* Correlations between each of the QFD constructs (i.e. QFD strategic planning, customer and market focus, QFD information and analysis, human resources

focus on QFD, top management commitment to QFD, QFD training to supervisors, and worker-supervisor collaboration in QFD efforts) will be positively related to creativity.

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H2. Correlations between each of the QFD constructs (i.e. QFD strategic planning, customer and market focus, QFD information and analysis, human resources focus on QFD, top management commitment to QFD, QFD training to supervisors, and worker-supervisor collaboration in QFD efforts) will be positively related to productivity.

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4. Subjects and procedure

4.1 Sample

The study focused on organisations operating in the United Arab Emirates (UAE). The Department of Economic Development in Dubai offers Quality Awards as a means of improving the standards of business operating in Dubai, thus boosting external and internal trade. The Department has a list of companies that have embarked on a wide range of quality management programs such as ISO 9000, TQM and *kaizen*. Questionnaires were sent to companies throughout Dubai randomly chosen from those listed with the Department of Economic Development. In order to reduce variability, questionnaires were sent only to companies that have received the Dubai Quality Award. A total of nine companies from the communications, public works, electricity and water, petroleum, cement products, and aluminium products industries participated in the study. Confidentiality and anonymity was assured to these companies. Despite their diversity, these companies have trained employees to reflect leading contemporary practices in the field of TQM (see www.dqg.org/2004/awards). Thus, the work environment in which the employees operated provided opportunities for meaningful TQM to occur. Interviews with both management and employees revealed that these organisations experienced some changes in both their internal and external environments following the implementation of their TQM program, which then led to increases in productivity, quality, and customer and employee satisfaction.

All respondents were full-time employees of the participating companies and volunteered to participate in the study. Questionnaires, written in English, containing the name and address of the business unit as a company or division, the items measuring creativity, productivity, and the QFD determinants were distributed to 410 employees in the nine companies. Three hundred and fifty nine useful questionnaires were received from the survey; yielding an 88 percent response rate. The proportion of distribution of responses received by industry category is shown in Table I.

The majority of the respondents were within the 21-30 age group (78 percent). Given the relatively young age of the sample, the level of work experience is accordingly low. Eighty-four (84) percent of the respondents have had four years of work experience or less. The respondents were 7 percent female and 93 percent male, and all had attained some sort of technical or university qualification taught in English.

4.2 Analytical procedure

An inferential statistical technique (ANOVA) was used to determine whether the sample data came from the same population or different populations. Confirmatory factor analyses (CFAs) were performed using the analysis of moment structures

Table I.
Distribution of responses
received by industry

Industry	Number of questionnaires sent	Distribution (%)	Number of responses received	Distribution (%)
Communications	73	17.81	60	16.72
Public works	28	6.83	19	5.29
Electricity and water	70	17.07	64	17.83
Petroleum	87	21.22	81	22.56
Cement	60	14.63	53	14.76
Aluminium	92	22.44	82	22.84
Total	410	100.00	359	100.00

(AMOS, version 5) software (Arbuckle, 2003) for the factor analysis of the measurement models. Using CFAs, we assessed the validity of the measurement models of the variables used in the paper. A mixture of fit-indices was employed to assess the overall fit of the measurement models. The ratio of chi-square to degrees of freedom (χ^2/df) was computed, with ratios of less than 2.0 indicating a good fit. However, since absolute indices can be adversely effected by sample size (Loehlin, 1992), four other relative indices, i.e. the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the comparative fit index (CFI), and the Tucker and Lewis index (TLI), were computed to provide a more robust evaluation of model fit (Tanaka, 1987; Tucker and Lewis, 1973). For GFI, AGFI, CFI and TLI, coefficients closer to unity indicate a good fit, with acceptable levels of fit being above 0.90 (Marsh *et al.*, 1988). For root mean square residual (RMR) and root mean square error approximation (RMSEA), evidence of good fit is considered to be values less than 0.05. Values from 0.05 to 0.10 are indicative of moderate fit and values greater than 0.10 are taken to be evidence of a poorly fitting model (Browne and Cudeck, 1993).

If the CFAs of the measurement models indicate that the values of the fit indices are equal to or greater than the recommended values described earlier (i.e. demonstrate adequate validity and reliability), we accepted these models as the best fitting models. Subsequently, we created a composite scale for each latent variable (Politis, 2001). For example, we created the composite latent variable of creativity using equation (1):

$$\begin{aligned} \text{Composite latent variable of creativity} = & 0.16OV_1 + 0.12OV_2 + 0.14OV_3 \\ & + 0.17OV_4 + 0.22OV_5 + 0.19OV_6, \end{aligned} \quad (1)$$

where OV_1 is observed variable 1, and 0.16 is the standardised factor score regression weight of OV_1 , given in the AMOS outcome, etc. These composite factors were then subjected to a series of correlational and regression analyses.

5. Results

5.1 Detecting organisational differences

The null hypothesis (H_0) that the population value for the average of the QFD and work outcome variables is the same for employees in the nine companies was tested using between- and within-company analysis. The results indicate that the between-company variance is greater than the within-company variance, and thus the greater the likelihood of significant difference. Moreover, the observed F ratios for

QFD strategic planning ($F = 6.33, p < 0.001$), customer and market focus ($F = 6.73, p < 0.001$), QFD information and analysis ($F = 7.95, p < 0.001$), human resources focus on QFD ($F = 10.75, p < 0.001$), top management commitment to QFD ($F = 8.72, p < 0.001$), QFD training to supervisors ($F = 6.67, p < 0.001$), worker-supervisor collaboration in QFD efforts ($F = 9.69, p < 0.001$), creativity ($F = 5.65, p < 0.01$), and productivity ($F = 7.43, p < 0.001$) exceeded the critical F ($F_{\text{crit}} = 2.61$, with $\alpha = 0.01$). On the basis of the calculated F values, H_0 is rejected, and it was therefore concluded that there is a significant difference among the means of the variables tested in this study. In other words, it is unlikely that the means of the QFD, creativity, and productivity variables are the same for the nine companies in the population. Thus, the relationship between the variables in this study may be more attributable to individual employees (and not companies), i.e. individual effects.

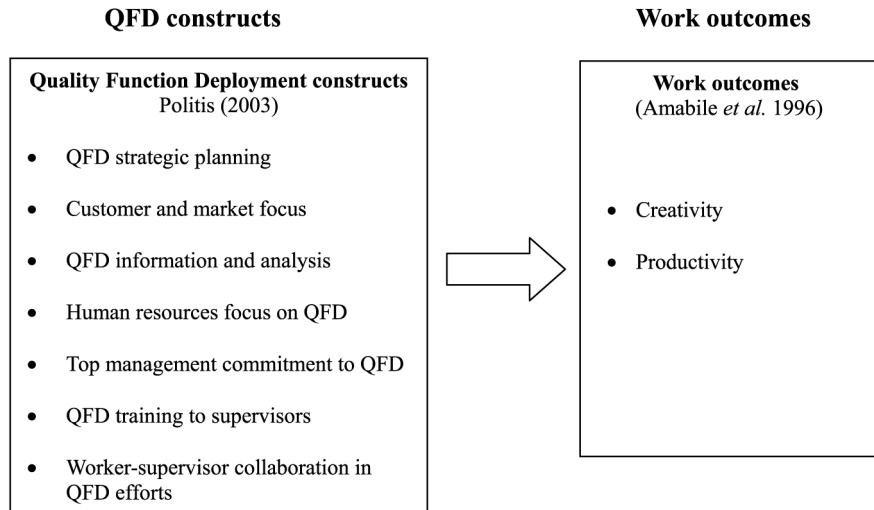
5.2 Measurement models

As noted earlier, the variables measured in the survey are QFD strategic planning, customer and market focus, QFD information and analysis, human resources focus on QFD, top management commitment to QFD, QFD training to supervisors, and worker-supervisor collaboration in QFD efforts and the outcome measures of creativity and productivity, as rated by the employees, of the participating organisations.

5.2.1 Independent variables. Quality function deployment constructs were assessed using Politis's (2003) 45-item instrument for measuring the underlying dimensions conducive to QFD. Responses to the 45 items were made on a seven-point Likert scale with response options from "strongly agree" to "strongly disagree". We conducted CFA of all QFD items in order to check for construct independence. We first fitted a seven-factor model to the data, corresponding to that proposed by Politis (2003). The fit indices of GFI, AGFI, CFI, TLI, RMR, and RMSEA were 0.97, 0.94, 0.95, 0.93, 0.04, and 0.07, respectively, suggesting that this model provides a good fit. Thus, the data supported the independence of the seven factors, namely, QFD strategic planning (four items, mean = 4.58, $\alpha = 0.82$), customer and market focus (ten items, mean = 5.37, $\alpha = 0.89$), QFD information and analysis (four items, mean = 5.22, $\alpha = 0.79$), human resources focus on QFD (six items, mean = 5.07, $\alpha = 0.87$), top management commitment to QFD (five items, mean = 4.56, $\alpha = 0.85$), QFD training to supervisors (five items, mean = 4.54, $\alpha = 0.71$), and worker-supervisor collaboration in QFD efforts (four items, mean = 5.47, $\alpha = 0.73$). It should be noted that seven items were dropped due to cross loading and/or poor loading, these being of the order of or less than 0.09.

5.2.2 Dependent variables. The outcome of work was assessed using Amabile *et al.*'s (1996) two work performance criteria, namely creativity (six items) and productivity (six items). Responses to the 12 items were made on a four-point Likert scale with response options from "never" to "always". We conducted CFA of all 12 items in order to check for construct independence. The fit indices of GFI, AGFI, CFI, TLI, RMR, and RMSEA were 0.97/0.95, 0.94/0.93, 0.94/0.95, 0.92/0.91, 0.04/0.06, and 0.08/0.09, for creativity and productivity, respectively, suggesting that it is appropriate to create two separate constructs. These are creativity (five items, mean = 2.76, $\alpha = 0.76$), and productivity (six items, mean = 2.88, $\alpha = 0.79$). One item from creativity was dropped due to poor loading, being of the order of 0.11.

Figure 1.
Summary of variables
used in the paper



The model of Figure 1 shows the hypothesised relationship between the seven QFD constructs and Amabile *et al.*'s (1996) creativity and productivity constructs.

5.3 Hypothesis testing

A descriptive analysis of responses for QFD and the work outcome factors of creativity and productivity was performed first to identify any prevailing patterns. The mean score for QFD strategic planning was 4.58 out of 7 (SD = 1.19, min = 1.00, max = 7.00), for customer and market focus 5.37 (SD = 0.96, min = 1.26, max = 7.00), for QFD information and analysis 5.22 (SD = 1.07, min = 1.24, max = 7.00), for human resources focus on QFD 5.07 (SD = 1.21, min = 1.00, max = 7.00), for top management commitment to QFD 4.56 (SD = 1.29, min = 1.20, max = 7.00), for QFD training to supervisors 4.54 (SD = 1.13, min = 1.00, max = 7.00), and for worker-supervisor collaboration in QFD efforts 5.47 (SD = 1.09, min = 1.22, max = 7.00). This amounts to the majority of the mean scores lying somewhere between the high end of "neutral" and "slightly agree". The mean score for creativity was 2.76 out of 4 (SD = 0.67, min = 1.20, max = 4.00), and for the factor of productivity it was 2.88 (SD = 0.59, min = 1.50, max = 4.00). This amounts to the majority of the mean scores lying somewhere between the high end of "sometimes" and "often".

The hypothesised relationships between QFD constructs and the work outcomes of creativity and productivity were tested using Pearson's correlation coefficients. All seven QFD variables showed significant correlations with the factors of creativity and productivity ($\rho < 0.05$). The results indicate that correlations between most of the QFD variables and the variable of creativity are positive and significant, largely supporting *H1*. Specifically, the results showed moderate positive correlations between creativity and QFD strategic planning ($r = 0.25$), customer and market focus ($r = 0.29$), QFD information and analysis ($r = 0.23$), human resources focus on QFD ($r = 0.28$), top management commitment to QFD ($r = 0.32$), and worker-supervisor collaboration in QFD efforts ($r = 0.26$). The results showed non-significant and near zero correlation

between creativity and QFD training to supervisors ($r = 0.04$). Moreover, the work outcome dimension of productivity has shown significant and positive associations with the QFD constructs, supporting *H2*. Specifically, the results showed rather strong and positive correlations between productivity and QFD strategic planning ($r = 0.34$), customer and market focus ($r = 0.32$), QFD information and analysis ($r = 0.28$), human resources focus on QFD ($r = 0.31$), top management commitment to QFD ($r = 0.32$), QFD training to supervisors ($r = 0.23$), and worker-supervisor collaboration in QFD efforts ($r = 0.29$).

In view of the significant correlations between the variables, further tests were performed to identify the main factors affecting the dimensions of creativity and productivity. This analysis was performed using regression models. The regression results indicated that the independent QFD constructs jointly explained about one fifth of the variance of the factor of creativity ($R^2 = 0.19$, $F = 4.4$, $\rho < 0.05$). The remaining 81 percent is not explained. Moreover, the QFD constructs explained about a quarter of the variance of the factor of productivity ($R^2 = 0.23$, $F = 5.40$, $\rho < 0.05$). The remaining 77 percent is not explained. One could assume that a portion of the remaining variance could be explained by the leadership styles of the participating companies, viz. Stogdill's (1974) consideration leadership, Bass's (1985) transformational/transactional leadership, and Manz and Sims's (1987) self-management leadership. Another portion of the remaining variance could be explained by the subordinates' perceptions of themselves – particularly their competence and the value of their work (Amabile *et al.*, 2004), the employees' mood (Isen, 1999), and the employees' personality characteristics (Feist, 1999).

In summary, the results of this study have shown that:

- there is a positive and significant relationship between the underlying dimensions that foster QFD and creativity; and
- the factor of productivity is more strongly associated with the variables of QFD than the factor of creativity.

6. Discussion

The aim of this study was to extend the field of research by investigating the relationship between the dimensions underlying the successful implementation of QFD, and organisational creativity and productivity. The findings are consistent with the realm of QFD application in improving product and process development time (Akao, 1990; Menon *et al.*, 1994), and cost reductions (Guinta and Praizler, 1993). The results of the study clarify which of the determinants of the work environment for QFD best predict creativity and productivity.

The key finding of this study is that the QFD determinants, as established by Politis (2003), are inextricably connected for the successful implementation of QFD. Specifically, the seven QFD determinants alone explained over 19 percent of the variance of creativity. This finding is particularly significant and important for organisations that are rich in TQM and *kaizen* programs. The findings suggest that it is the top management commitment, worker-supervisor collaboration in QFD efforts, internal processes and strategies for QFD, the effectiveness of use of information and data to support QFD actions, and building relationships with customers that enhance

employees' skills in implementing QFD processes, which are most conducive to creativity.

Furthermore, it is also important to note that the remaining 81 percent of the variance is not explained by the variables tested in this study. One could assume that a portion of the remaining variance could be explained by other organisational variables. These may be the leadership styles, *gemba* (where the customer interfaces with the service), the behaviour embedded in structures of social relations (Granovetter, 1985), the dimensions that foster creative working environments (Amabile *et al.*, 1996), and the employees' mood and personality characteristics. These variables should be examined through a series of field or experimental studies.

Moreover, the findings are consistent with the literature of QFD and productivity. The study identified relatively strong relationships between the QFD determinants and productivity. Specifically, the seven QFD determinants alone explained over 23 percent of the variance of productivity. It is important to note that the factor of productivity is more strongly associated with the determinants of QFD than the factor of creativity. It is indicated by this finding that top management commitment, worker-supervisor collaboration in QFD efforts, strategies for QFD, and the effectiveness of use of information and data to support QFD actions, are deemed essential in creating an organisational climate conducive to QFD implementation, which in turn increases organisational productivity.

We conclude that UAE organisations that embark on TQM, *kaizen* and QFD programs must:

- demonstrate top management commitment to QFD;
- facilitate worker-supervisor collaboration in QFD efforts;
- institute internal processes and strategies for QFD;
- establish effective use of information and data to support QFD actions;
- build relationships with customers;
- enable employees to develop and utilise their capacity to deliver value to customers; and
- enhance QFD team-building, consensus-oriented, and flexibly disciplined approach that structures synthesising new ideas.

6.1 Limitations and future work

While this research has established a clear relationship between the dimensions underlying the successful implementation of QFD and organisational creativity and productivity, some caution must be exercised when interpreting these findings due to a number of limiting factors. First, although a quantitative study is able to establish a relatively clear picture of relationships between phenomena, it is less apt at explaining the reasons behind it. Thus, future qualitative research needs to be considered to explore the exact reasons why the QFD constructs, as established by Politis (2003), tend to lead to stronger associations with productivity than with creativity. Other limitations include the use of a relatively undeveloped instrument measuring the underlying dimensions conducive to QFD (seven items were dropped from the measurement model due to cross or poor loading), and the inability to establish causality.

Finally, although the statistically significant F ratios suggest that it is unlikely that all population means are equal, they do not tell which companies are different from each other. Replication work could address this issue by using the Bonferroni or Scheffe multiple comparison procedure (Neter *et al.*, 1985). Moreover, the findings from ANOVA do not indicate company-based effects. The effects from ANOVA thus weaken overall inferences relative to relationships that supposedly apply to the company as a whole and may explain the general lack of company-based effects. To draw stronger inferences, employee-first line manager dyads (independent of the companies) and individual employees could be examined over time.

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