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Damjan Maletic

Univerza V Mariboru

Matjaz Maletic

University of Maribor, Kranj, Slovenia

Bostjan Gomiscek

University of Wollongong in Dubai, BostjanGomiscek@uowdubai.ac.ae

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The impact of quality management orientation on maintenance performance

Damjan Maletič, Matjaž Maletič and Boštjan Gomišček

Laboratory for Quality Management, Faculty of Organizational Sciences, University of Maribor, Kranj, Slovenia

This paper aims to examine the relationship between quality management orientation dimensions and maintenance performance. The concept of quality management orientation is proposed and defined as a set of norms and values regarding customer orientation, quality responsibility, prevention, and process orientation. Empirical data was drawn from a sample of Slovenian organizations in order to address the research question. The data was analysed using exploratory factor analysis, confirmatory factor analysis, correlation analysis and regression analysis. The findings indicate that quality management orientation is important predictor of maintenance performance. Data analysis results also show that quality management orientation dimensions are positively related to maintenance performance. By testing the impact of quality management orientation on maintenance performance, this study shows that strong foundation on quality management orientation is an effective way of improving maintenance performance.

Keywords: quality management, quality culture, maintenance, maintenance performance, continuous improvement

1. Introduction

The increased complexity of today's business environment and heightened international competition make it necessary for organizations to improve quality performance by aligning their quality practices in their attempt to capitalise on all possible traditional and non-traditional sources of competitive advantage (Vecchi and Brennan 2009).

As revealed in the literature (e.g. Dahlgaard et al. 1998), strong orientation towards quality management plays an important role in spreading the quality philosophy through the entire organization. According to the Demirbag and Sahadev (2008), the quality orientation of the organization is linked to a widespread understanding among members of the organization about the importance of quality, a well-established quality policy, as well as practices and systems that are oriented to achieve the basic tenants of the policy. Treating quality as a cultural phenomenon means that quality is approached as a set of values, as a general orientation, and an organizational ideology rather than just as a set of tools or techniques (Cameron and Wesley 1999). Consistently with the description of quality culture by Wu et al. (2011), we understand the concept of quality

management orientation to be composed of values that describe customer orientation, quality responsibility, prevention, and process orientation.

The importance of organizational culture to manufacturing strategy has been recognized (Stock et al. 2007), but there has been little empirical research regarding quality culture (Cameron and Wesley 1999). While acknowledging the contribution of the organizational culture on the organizational performance (e.g. Yilmaz et al. 2005), the literature review reveals a lack of empirical studies that examine the impact of specific subsets of an organization's overall culture on different dimensions of the organizational performance (e.g. maintenance performance). Underlying this argument it is important to explore the impact of quality management orientation on maintenance performance. Furthermore, it has been acknowledged by many authors that maintenance is a major contributor to the performance and profitability of manufacturing systems (Al-Najjar and Alsyouf 2003, Al-Najjar and Alsyouf 2004, Parida and Kumar 2006, Kans and Ingwald 2008). Selecting an appropriate maintenance policy (Chan and Prakash 2012) is essential for companies to maintain their competitiveness, and to consider the "soft" aspects (i.e. behavioural and cultural aspects). In this sense, Willmott (1994) argues that greater benefits result from total productive maintenance (TPM), especially when a total quality and team working culture already exists within a company. Yet, despite this, not enough attention has been paid in the literature in order to explore the impact of different organizational cultural dimensions on maintenance performance - by means of the presented study this issue is studied in more detail. Specifically, this study examines whether strong foundation on quality management orientation has a positive influence on maintenance performance. Thus, the recognition of quality management orientation's role in organization's success necessitated the need to explore the interaction between mentioned areas. Although, theoretically the use of different maintenance approaches is an important part of improvements in maintenance performance, in reality a considerable number of organizations have fallen short in implementing their approaches and programs. For instance, as reflected by the study of Tsang and Chan (2000), organizations that are not ready to change their culture will not be successful in implementing TPM. Therefore, as mentioned above, in this study we examined performance effects of adoption of a quality oriented philosophy in the maintenance area.

2. Theoretical background

2.1 Theoretical perspectives on interaction between organizational culture and performance

In the first part of this section the link between organizational culture and overall performance is outlined, followed by a discussion of the role of cultural aspects in the maintenance area.

Some research indicates (e.g. Dahlgaard-Park 2011) that many quality efforts do not reach their full potential due to insufficient understanding about the human aspect. Thus, it can be argued that "soft" aspects are very important element in the process of

implementation of different approaches. In this relation, it has been pointed out that quality management programs go beyond implementing technical management practices (Prajogo 2005), and require support of culture and attitude of organizational members that aim to satisfy customer's needs (Hackman and Wageman 1995).

A number of studies have been devoted to examine the role of culture as organizational resource or asset which affects performance (e.g. Prajogo and McDermott 2011, Stock et al. 2007). As time passed, organizational culture began to receive more attention in quality management (Maull et al. 2001). This shift of emphasis was driven by the fact that in theory, total quality management (TQM) seems to assure performance improvement for any organisation, but however, in practice, TQM works for some organisations and not for others (Terziovski 2006). As pointed out by Jung et al. (2000), TQM can only be successfully implemented when the corresponding organizational culture is taken into consideration. However, any organization that uses complex facilities in producing products also realises that maintenance plays a key role in their TQM approach (Ben-Daya and Duffuaa 1995). It is argued that long-term profitability and competitiveness, by means of quality management, cannot be achieved without sustained equipment performance (Hansson et al. 2003).

Similar to the discussion above, several authors have also observed that lack of cultural elements diminish the chance for the successful implementation of TPM (Tsang and Chan 2000). These findings support the argument that organizations should establish a culture in which all employees are constantly looking for ways of improving equipment performance (Willmott 1994). A similar argument has been brought forward by Graisa and Al-Habaibeh (2011). They indicated that the implementation of the available technology and especially cultural change of employees and management are necessary to achieve the desired objectives of the process.

Considering arguments outlined above, it is vital for organization to recognize that cultural support is an essential element for the effective implementation of maintenance practices (Willmott 1994). Thus, one can argue that managers stand to benefit by understanding the cultural elements that tend to be most strongly associated with high maintenance performance (Willmott 1994). As such, it is important for organizations to know which cultural elements (dimensions) are most closely associated with performance (Prajogo and McDermott 2011). Further, Corbett and Rastrick (2000) indicated that if organizations wish to be able to change their cultures and improve their quality to become more effective, then it is important that they understand and can identify their present organizational culture. Nevertheless, top management involvement is also crucial to the successful implementation of a maintenance program. By the involvement of top management in the practice of effective maintenance and reliability management, the culture of the entire organization is sensitized to the need and importance of supporting an effective maintenance and reliability management program (Madu 2000, p. 948). Thus, maintenance leaders must develop and nurture an

organizational culture that clearly supports long-term continuous maintenance improvement (Peters 2006).

2.2 An overview of maintenance performance measurement

In the literature (Al-Najjar 2007), maintenance performance is clearly identified as a critical component of company's competitiveness. Maintenance is therefore vital for sustainable performance of a production plant (Muchiri et al. 2010). As stated by Sharma et al. (2006), development, adoption and practice of new maintenance strategies with a focus on how to increase the productive time by maximizing availability and how to avoid unplanned breakdowns, had become essential.

In order to ensure a good performance of the production plant, organization needs to follow up the performance of maintenance processes (Parida and Chattopadhyay 2007). However, without having a formal measurement system for performance, it is difficult to plan, control and improve the maintenance process (Åhrén and Parida 2009). Like other manufacturing functions, performance measurement is important in managing the maintenance function (Muchiri et al. 2011). The importance of maintenance performance measures have been discussed by many authors (Parida and Chattopadhyay 2007, Parida and Kumar 2006, Muchiri et al. 2011). For instance, Parida and Chattopadhyay (2007) developed a multi-criteria hierarchical maintenance performance measurement framework, which is balanced, holistic and integrated to various levels of the organization. Thus, it is important that organization uses indicators, which are utilized to evaluate the effectiveness of maintenance carried out (Wireman 1998). As noted by Wudhikarn (2012), the accuracy of performance measurement is essential to improve and succeed in a business goal. In addition, Muchiri et al. (2010) state that well-defined performance indicators can potentially support identification of performance gaps between current and desired performance and provide indication of progress towards closing the gaps.

The measurement of maintenance performance has therefore become an essential requirement for the industry. However, major issues related to this field concern what to measure and how to measure it (Neely 1999). The maintenance performance literature shows that different authors have different classifications of maintenance performance indicators. However, some indicators have been recognised by all authors as essential for management of maintenance function, such as for instance frequency of breakdowns, mean time between failures (MTBF), availability and overall equipment effectiveness (OEE) (Muchiri et al. 2010). For example, OEE is gaining increasing interest as a key measure for measurement of equipment performance. Originally OEE was proposed by Nakajima (1984, 1988). However, the literature provides us with many modified versions of OEE with regard to the concept of its application (e.g. Muchiri and Pintelon 2008, Zammori et al. 2011). Therefore, measuring performance of maintenance is complex as it involves various indicators (Parida and Chattopadhyay 2007), and requires a systematic approach to measure, monitor and continuously improve performance (Simoes et al. 2011).

3. Research question

To improve the asset performance at reduced cost, strategies like TPM, condition-based maintenance (CBM) and reliability centred maintenance (RCM) have evolved with passage of time (Sharma et al. 2006). For instance, TPM is designed to maximize equipment effectiveness by establishing a comprehensive maintenance production system covering the entire life of equipment and involving every one, i.e. from top management executives to the production floor operators (Sharma et al. 2006). The concept of TPM suggested by Nakajima (1988) proposed OEE as a metric for evaluating the progress of TPM. However, several studies (e.g. Graisa and Al-Habaibeh 2011, Willmott 1994) reported that cultural change of employees and management are necessary to achieve the desired objectives of the maintenance practices deployment. Therefore, this implies that quality awareness is very important when organization is striving to achieve a better maintenance performance. By means of this study, we seek to address this issue.

The literature review presented in this paper has highlighted several arguments that postulate the importance of quality orientation in relation to maintenance performance. While these various studies have emphasised the role of quality culture in the field of maintenance, none of the earlier studies has empirically investigated the link between different cultural dimensions and maintenance performance. Drawing on from these previous researches, this paper therefore presents a novel, unique contribution in the field of quality and maintenance management. We posit that strong orientation towards quality in terms of customer orientation, quality responsibility, prevention, and process orientation, can be an effective way of achieving and maintaining better maintenance performance. We therefore believe that it is important to examine these arguments through empirical study. In guiding the direction of the analysis, research question was developed based on the findings identified in the literature. The primary research question of this study can be articulated as follows:

RQ: Is there a positive relationship between quality management orientation and maintenance performance?

Based on the above literature review, a research framework is developed to address the research question. The framework is presented in Figure 1.

Figure 1: Research framework

As illustrated in Figure 1 the framework presents the relationship between quality management orientation and maintenance performance. In order to examine this relationship eleven items were identified in this study (see Table 1). This paper recognizes the quality management orientation as a multidimensional construct. It reflects values and the orientation towards quality in terms of customer orientation, quality responsibility, prevention, and process orientation.

Customer orientation. How an organization is performing from its customers' perspective has become very important. According to Kaplan and Norton (1992), viewing a business from the customer perspective involves asking the question: "How do customers see us?" Kaplan and Norton (1996) also defined four main areas of customer concern: time, quality, cost, and performance. Therefore, concerning the production perspective, the main objective is to satisfy and preferably exceed the needs and customers' expectations. In this respect, Dean and Bowen (1994) noted that the goal of satisfying customers is fundamental to quality management and is expressed by the organization's attempt to design and deliver products and services that fulfil customer needs. Within ISO 9001:2000 the customer focus was adopted as one of the eight quality management principles (ISO 9001:2000).

Responsibility. Responsibility is widely recognized as a part of quality management practices. In this regard, prior studies (e.g. Dow et al. 1999, Douglas and Judge 2001) included responsibility in their measurement scales of quality management practices. Responsibility also plays a vital role in quality culture. Hence, for an organization, a quality culture is one in which everybody is responsible for quality improvement (Dahlgaard et al. 1998).

Prevention. Crosby (1982) in his book *Quality Is Free* makes the point that it costs money to achieve quality, but it costs more money when quality is not achieved. According to him quality is conformance to requirement and can only be measured by the cost of non-conformance. The intention is to put more effort on preventing defects and less on inspection and rework. Therefore, quality assurance and quality

management systems use quality management tools and methods to deploy prevention across the production processes (Dahlgaard et al. 1998, Hackman and Wageman 1995).

Process orientation. Process management practices reflect an organization's commitment to enhance the reliability and control for performance and at the same time search for better methods to improve the processes (Dean and Bowen 1994). Management's main responsibility is to stimulate and support the effort of employees to improve processes (Berger 1997). Further, Jaca et al. (2012) addressed the importance of management commitment and employees involvement as key factors to sustain continuous improvement of the organization processes. In particular, organizations can enhance their performance by improving the efficiency of the processes as well as putting a strong focus on continuous improvement (Wu et al. 2011).

Since this research was not aimed at developing or validating another quality management orientation construct, we decided to adopt a measurement scale from previous studies. Therefore, the operationalization of the quality management orientation construct is merely derived from the literature on the quality management (Wu et al. 2011).

The items relating to performance variables were developed based on a review of the literature on maintenance performance measurement. The performance of production equipment can be explained by the widely known OEE (Nakajima 1988). It identifies and measures losses of important aspects of manufacturing namely availability, performance and quality rate. This supports the improvement of equipment effectiveness and thereby its productivity (Muchiri et al. 2010). The availability is expressed as the percentage of the plant availability used for manufacturing/production (Parida and Chattopadhyay 2007). Among the key measures that maintenance seeks to monitor and control, are also the equipment failure frequency (measured by MTBF) and the repair time (measured by time to repair - MTTR) (Muchiri et al. 2011). Therefore, four performance measures (OEE, availability, MTBF and MTTR) related to equipment performance were identified and used for the purpose of this study.

4. Methodology

4.1 Sample

This study utilized a survey of a sample of Slovenian organizations, encompassing various sectors. The survey was conducted by the web-based method. A random sample was included in the survey on the basis of the Slovenian business register "bizi.si" and Slovenian Maintenance Society's database. The final number of complete and usable responses was 53. The power analysis shows that the sample size used in this study meets the sample size requirement for a power level of 0.8 at probability level 0.05.

The questionnaire was responded by manufacturing, construction, transportation and other type of industry, in portion of 77.4%, 7.5%, 3.8% and 11.3%, respectively. In terms of organizational size (following the guidelines of the Statistical Office of the Republic of Slovenia), 26.4 % of the sample was made up of small sized organizations employing 50 employees or less, 43.4 % were medium sized organizations, employing

51 - 250 employees, 9.4 % organizations were with 251 – 500 employees and 20.8 % organizations were with more than 500 employees.

4.2 Measures

Several topics were conceptualized to formulate the questionnaire, each tested on five-point Likert scale (1 = “strongly disagree”, 5 = “strongly agree”). The instrument developed in this study consists of two major parts (see section 3). The first part comprises items measuring quality management orientation and the second part comprises items measuring maintenance performance (Table 1). The seven-item scale for quality management orientation captures the extent to which quality as a philosophy is adopted within the organization. These quality management orientation dimensions were derived from literature focusing on customer orientation, quality responsibility, prevention, and process orientation as discussed in section 3.

A review of the literature on maintenance performance measurement reports on many different indicators for measuring the output of the maintenance process (e.g. Muchiri et al. 2011). To address the purpose of this study, we developed a construct for measuring maintenance performance composed from four items, as described in section 3.

Table 1. Construct validity and reliability

Factor	Items	Factor loading	Cronbach's alpha	Mean (S.D.)
Quality Management Orientation (QMO)	QMO1: We believe that organizations should be proactive in anticipating their customers' needs.	.646	.852	4.37 (.662)
	QMO2: We believe that quality is everyone's responsibility in the organization.	.677		4.49 (.675)
	QMO3: A shared vision and objectives of quality among employees in the organization are essential for effectiveness	.868		4.41 (.894)
	QMO4: In our view, quality should be designed into a product/process, rather than defects inspected out after the fact.	.828		4.24 (.916)

	QMO5: We believe that the process, rather than the people performing the process, is the source of most errors.	.577		3.49 (1.075)
	QMO6: We believe that process improvements will result in higher effectiveness of organization.	.679		4.34 (.855)
	QMO7: We dedicate a lot of time to education for quality.	.581		3.63 (1.135)
% of variance	56.075			
<hr/>				
Maintenance performance (MPI)	MPI1: We are achieving high availability of assets.	.797	.880	3.61 (.954)
	MPI2: Repair times (MTTR) are consistent with the plan.	.711		3.41 (1.087)
	MPI3: We are achieving high Overall Equipment Effectiveness (OEE).	.739		3.39 (1.145)
	MPI4: We are achieving times between failures (MTBF), which are in accordance with the manufacturer's specifications.	.728		3.22 (.987)
	% of variance	11.712		
<hr/>				
S.D. - standard deviation				

4.3 Research methods

4.3.1 Exploratory factor analysis

For the purpose of validating the measurement instrument we used an exploratory factor analysis. Exploratory Factor Analysis (EFA) approach is applied to uncover the underlying structure of a relatively large set of variables (Field 2005). Therefore, the aim of factor analysis is the reduction of a large number of intercorrelated measures to a few representative constructs or factors. However, as seen below, this paper adopted a combined exploratory–confirmatory approach to validate quality management orientation and maintenance performance constructs. First, data were subject to exploratory factor analysis. In addition, we applied confirmatory factor analysis (CFA) using the AMOS software.

4.3.2 Regression analysis

Regression analysis was used in order to analyse the relationship between a dependent variable (maintenance performance) and independent or predictor variable (quality management orientation). Therefore, in simple regression analysis we seek to predict an outcome variable from a single predictor variable by fitting a linear equation to

observed data. Overall fit of the model can be assessed by R^2 and F statistics (Field 2005). The term R-squared refers to the fraction of variance explained by a model, while on the other hand the F statistics refers to the overall significance of the regression model. Moreover, the contribution of the individual variable is assessed by the Beta value (obtained in the SPSS output). The Beta value indicates strength of the relationship between independent and dependent variable.

4.3.3 Confirmatory Factor Analysis (CFA)

A measurement model may be developed based on theory and then tested with confirmatory factor analysis (CFA) (Hair et al. 2010). The CFA is used in this paper merely to test for convergent validity and for measuring the adequacy of the measurement model. Basically, convergent validity refers to the extent to which the measurement items converge into a theoretical construct (Hair et al. 2010). AMOS 19 was employed for validating the measurement model of each construct. To assess convergent validity, the standardised factor loading should be significantly linked to the latent construct and have at least loading estimate of 0.5 and ideally exceed 0.7 (Hair et al. 2010). Various goodness of fit (GOF) measures used in this study include the likelihood ratio chi-square (χ^2), the ratio of χ^2 to degrees of freedom (χ^2/df), the GOF index (GFI), the adjusted GOF (AGFI), normed fit index (NFI) and the root mean square error of approximation (RMSEA).

5. Results

5.1 Exploratory measurement results

In order to confirm the latent factor structure for measured variables, an exploratory factor analysis (EFA) was performed. Therefore, the dimensions of the scales were examined by the EFA using the principal components analysis with Varimax rotation method. The complete items of these scales are presented in Table 1. Results produced a two-factor solution, with eigenvalues greater than one, accounting for 67.8% of the variance (Kaiser-Meyer-Olkin - KMO statistic 0.759; Bartlett statistic 309.696; significance 0.000). Apart from KMO statistic for multiple variables, we also examined KMO values for individual variables that are produced on the diagonal of the anti-image correlation matrix which is provided by the SPSS outputs. All values are well above 0.5 indicating that there is no need to consider if any variables should be excluded from the analysis (Field 2005).

An exploratory analysis of the scales was used to check for any possible cross loading problems of the measurement items. As shown in Table 1, one item representing the education for quality (QMO7), which loaded on the factor named as quality management orientation, was dropped from subsequent analysis. The EFA provides some justification that quality management orientation and maintenance performance are operationalized as two distinct unidimensional constructs. Hence, we averaged the items under each factor to produce two five-point scales scores: quality management orientation and maintenance performance.

To test the reliability, the internal consistency of the questionnaire was measured using Cronbach's alpha coefficient. The Cronbach's alpha value for each construct is shown in Table 1. The alpha value for each construct was well above the recommended value of 0.70, which is considered satisfactory for exploratory research (Hair et al. 2010).

5.2 Confirmatory Factor Analysis (CFA)

The results of the CFA for quality management orientation measurement model show that measurement items are statistically significant related to the construct ($p < 0.05$), while the standardized loadings range from 0.59 to 0.91. The only exception is the loadings of the Quality Management Orientation 5 (QMO5) which was just below the value of 0.5. Nevertheless, it was left in the model due to content considerations. The fitting indices were checked with their respective acceptance values (Hair et al. 2010). The measurement model shows acceptable fit ($\chi^2 = 7.607$, $\chi^2/df = 0.951$, GFI = 0.945, AGFI = 0.856, NFI = 0.947, RMSEA = 0.00).

The convergent validity of maintenance performance construct was also assessed using the CFA. All factor loading estimates were significant and exceeded 0.50 (ranged from 0.712 to 0.875). The model fit indices also indicate acceptable fit ($\chi^2 = 0.154$, $\chi^2/df = 0.145$, GFI = 0.998, AGFI = 0.985, NFI = 0.999, RMSEA = 0.00).

Overall, the results of the CFA show that ratio for χ^2/df value is well below acceptable value of 2 and goodness of fit measures are well above 0.9, suggesting that both models have adequate fit (Koufteros 1999). The root mean square error of approximation (RMSEA) values are less than 0.05, indicating a good fit and represents reasonable errors of approximation in the population (Hair et al. 2010). Hence the both measurement models are reasonable representations of the data.

5.3 Correlation analysis

Bivariate correlations for all variables involved in this study are presented in Table 2. The Pearson correlation matrix (Table 2) shows that quality management orientation variables are positively and significantly related with maintenance performance. As can be seen in Table 2, the strongest relationship was found between QMO2 and maintenance performance ($r = .650$, $p < .01$). Furthermore, our results support a moderate correlation between QMO1 ($r = .563$, $p < .01$), QMO3 ($r = .460$, $p < .01$), QMO4 ($r = .432$, $p < .01$), QMO6 ($r = .425$, $p < .01$) and maintenance performance. Moreover, the correlation analysis revealed that weakest correlation is between QMO5 ($r = .415$, $p < .01$) and maintenance performance, but still significantly positive. Nevertheless, it appears that when the level of quality management orientation increases, the level of maintenance performance increases as well. However, considerable caution must be taken when interpreting the results of the correlation analysis because coefficients give no indication of the direction of causality (Field 2005). Hence, the causal direction between quality management orientation construct

and maintenance performance construct is tested with the regression analysis, and the results are presented in the following section.

Table 2. Correlation matrix

Construct	Correlation matrix					
	1	2	3	4	5	6
QMO1	1					
QMO2	.710**	1				
QMO3	.752**	.775**	1			
QMO4	.427**	.652**	.728**	1		
QMO5	.340**	.249**	.357**	.435**	1	
QMO6	.437**	.527**	.530**	.498**	.413**	1
MP	.563**	.650**	.460**	.432**	.415**	.425**

** Correlation is significant at the 0.01 level (2-tailed)

5.4 Regression analysis

A Table 3 shows that the linear model tested is significant ($F = 24.62$, $p < .05$). Moreover, the value of R square is .387, which implies that quality management orientation can account for 38.7% of the variation in maintenance performance. Results of regression analysis demonstrated that quality management orientation has a significant effect ($\beta = .622$, $p < .01$), thereby providing the positive answer to the research question formulated in this study.

Table 3. Regression analysis

R - Square	F – Change	N	Sig. F - Change
.387	24.62	53	.000
Independent variable	Standardized coefficient (Beta)	t	Sig.
Constant		.084	.014
Quality management orientation	.622	4.962	.000

Predictor: Quality management orientation

Dependent variable: Maintenance performance

6. Discussion

The primary purpose of this study was to investigate the relationship between quality management orientation and maintenance performance and to identify the effect of

different norms, values and beliefs, which we described as quality management orientation dimensions, on maintenance performance. Every study dealing with organizational culture needs to be aware of the multiple dimensions of organizational culture (Naor et al. 2010). The existence of different kinds of subcultures within organizations also needs to be accounted for. As such, the results of the exploratory factor analysis are consistent with the quality culture described in the literature (Wu et al. 2011).

Objective of this study was to delineate the impacts of quality management orientation dimensions on maintenance performance. The present study contributes to the growing research stream by examining the effects of cultural dimensions on several dimensions of organizational performance (Wu et al. 2011, Prajogo and McDermott 2011, Yilmaz and Ergun 2008, Yilmaz et al. 2005). Taken as a whole, the findings of this study underscore the importance of understanding the role quality management orientation plays as a resource in pursuing different maintenance performance measures. Hence, results of regression analysis provide us with evidence of positive relationship between quality management orientation and maintenance performance. The results, therefore confirm the importance of quality management orientation in the field of maintenance, because it influences the effort to achieve higher maintenance performance outcome. A plausible explanation is that organizations need support of organizational/quality culture in order to be successful in the implementation of maintenance programs (Tsang and Chan 2000). However, this means that it is imperative that management and employees are committed to the implementation of maintenance programs (Hansson et al. 2003), and that a strong foundation on quality management orientation is present. Thus, in response to research question, the findings indicate that quality orientation has a significant effect on maintenance performance. Our findings are promising, since it is beneficial for an organization to endorse a strong commitment to continuous improvement in the field of maintenance (Maletič et al. 2012).

Support of the organizational culture is important when implementing different maintenance approaches, such as TPM (Ahuja and Khamba 2008, Willmott 1994). In view of this, our results have produced valuable insights pertaining to the role of quality management orientation in the field of maintenance, especially because cultural support has often been missing as an essential element for the successful implementation of quality and maintenance management programs (e.g. Mohammad and Rad 2006, Willmott 1994). For instance, Willmott (1994) suggests that quality and team working culture should exist in organization in order to achieve greater results from TPM implementation. As such, organizations that strive to achieve high performance need to emphasize the role of quality management orientation.

Quality management orientation was operationalized with four dimensions: customer orientation, quality responsibility, prevention, and process orientation. The results of correlation analysis showed that strongest relationship was found between items, which describe quality responsibility and maintenance performance. This result is

also somewhat consistent with the findings of several previous studies in this area. For example, Snape et al. (1995) stated that employees will respond in a highly committed and motivated way if given autonomy and responsibility. Similarly, Jiménez-Jiménez and Martínez-Costa (2009) indicated that a quality management environment fosters employee empowerment. Further, according to the literature, TQM should promote empowerment of front-line employees, giving them more responsibility and information (Schuler and Harris 1992). Likewise, TPM also involves everybody in the organization and requires joint responsibility (Cooke 2000). According to the correlation analysis customer orientation is also significantly related to maintenance performance. This result corroborates the study of Ahuja and Khamba (2008), who reveal that focus on customer satisfaction is one of the identified critical significant factors for the effective adaptation of TQM and TPM programs. For example, Terziovski and Samson (1999) found that TQM has a significantly positive effect on operational and business performance, employee relations and customer satisfaction. Our finding regarding customer orientation is also in a line with statement that maintenance processes add to customer value in terms of profit, quality, time and service (Zhu et al. 2002). Furthermore, our results also support a moderate correlation between prevention and process orientation with maintenance performance. This finding contributes to the literature on quality management practices (Saraph et al. 1989), indicating that the goal of the process management should be to clarify the process ownership, boundaries, and steps. Consequently, organizations should therefore be less reliance on inspection.

7. Conclusion

This study contributes to the quality management and maintenance literature by validating the impact of quality management orientation on maintenance performance. In response to research question, our results support the positive role of quality management orientation in maintenance processes. Therefore strong foundation on quality management orientation is shown to be an effective way of improving maintenance performance. The findings also show a positive correlation between quality management orientation dimensions and maintenance performance. This suggests that there is a link between quality management orientation in terms of customer orientation, quality responsibility, prevention, process orientation and maintenance performance. Therefore, by and large, this study supports the positive argument concerning the applicability of quality management principles in the field of maintenance.

Despite the overall findings produced in this study, we believe that this topic still opens opportunities for further studies. Study could be furthered in several ways. First, future studies can segregate different dimensions of quality orientation and maintenance performance and examine the relationship between these dimensions and different maintenance strategies. Second, we suggest that future study can be done with a larger sample size to re-test the results of this study, enhancing the statistical power to generalize the findings.

From a managerial perspective, the study emphasizes the need to recognize the different quality management orientation dimensions, in relation to their roles in influencing the outcomes of the maintenance processes. Our research has therefore also practical value to managers. The theoretical arguments and empirical results confirm that organizations pursuing quality management oriented philosophy in the maintenance area can meet their maintenance performance improvement expectation. The positive interaction between quality management orientation and maintenance performance suggests the synergy between the two as well as supporting the need to consider the “soft” aspects in order to achieve desired maintenance performance.

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