Health-care technology management: developing the innovation skills through implementing soft TQM among Lebanese hospitals

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Health-care technology management: developing the innovation skills through implementing soft TQM among Lebanese hospitals

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The objective of this research is to determine the influence of implementing soft total quality management (TQM) on the innovation skills (INS) of employees in Lebanese hospitals. A quantitative methodology was applied through conducting a cross-sectional survey among the employees and health-care professionals at 13 accredited hospitals in Lebanon. The respondents agreed that they were implementing the soft TQM principles and practicing the INS. However, the results showed that soft TQM influenced INS through people-based management ($p < .05$) but not through continuous improvement ($p > .05$). The major contribution of this research is centred on its empirical part since there is a lack of empirical studies in the field of health care in Lebanon. In addition, the shift from the hard side to the soft side of TQM contributes significantly to the academic literature as well as the methodological part especially in terms of using structural equation modelling analysis. This study was limited because of lack of participation especially from the public health sector in Lebanon. Thus, future studies are recommended to extend the research geographically and include more hospitals from both private and public sectors.

\textbf{Keywords}: soft TQM; innovation skills; people-based management; continuous improvement

1. Introduction

Health-care technology management (HTM) has become of great importance in solving the problems faced by health-care organisations especially hospitals. It provides the appropriate means for improving the quality of health-care services and increasing the competitive advantages of hospitals. Such advantages occur when hospitals effectively combine different attributes, mainly technology, innovation and skilled human resources. Therefore, health-care professionals can take benefits of implementing HTM practices to make successful decisions, evaluate the competency levels and develop the skills of their employees.

By definition, HTM is a field that requires the involvement of staff from technical, clinical, financial and administrative disciplines. It is not just the job of managers; it is the responsibility of all members of staff who deal with health-care technology (Lenel, Bird, Kawohl, & Kaur, 2009). The integration of the technical, organisational and economic aspects of health-care technologies provides the employees with the knowledge and skills needed to work in such an active environment. Therefore, it is a system that enables health-care practitioners to manage the design, development and maintenance
of medical devices, as well as the implementation, utilisation and assessment of hospital-based health-care technologies.

Mainly, HTM guides the transformation of some actions as a part of the continuous improvement (CI) strategy of the hospital, generating an incremental or radical innovation within the health-care process (De Moraes, Garcia, Ensslin, Conceição, & Carvalhoet, 2010). Therefore, improving the employees’ innovation skills (INS) is essential to develop and adequately incorporate such innovated processes into the health-care context. INS are practically a combination of cognitive, interpersonal and practical skills that permit employees to perform their work in a creative and innovative way (Chell & Athyade, 2009; Morris, 2008).

However, it is a challenge for hospitals to maintain such CIs and innovations especially with the limit of employees’ participation. These concepts are consistent with the principles of total quality management (TQM) which is an integrated system of continuous quality improvement that is based on teamwork and employees’ participation (Aikens, 2011).

Several studies have been conducted in terms of TQM, some focused on the hard side which reflects the quality control tools and statistical techniques (Abrunhosa & Moura, 2008; Prajogo & Sohal, 2006; Zehir, Ertosun, Zehir, & Muceldilli, 2012) while others have been concentrating more on the soft side of TQM. Soft TQM includes the practices of TQM which are related to the human resource skills including leadership, teamwork, training and employees’ involvement (Kemenade, 2012; Lewis, Pun, & Lalla, 2006; Raphael, 2010; Yeh, 2011).

Hence, without an effective health-care system to help hospitals achieve their goals, innovation and sustainability of performance will be limited. Thus, an interactive and innovative approach is needed to successfully implement the principles of TQM especially at the level of human capital. People-based management (PBM) is believed to empower the employees and integrate them in the decision-making process. In addition, CI may establish these concepts and develop the INS of employees as a strategy for increasing the competitive advantages of hospitals.

This study reviews the recent literature and presents a theoretical framework to empirically examine the effect of soft TQM on the INS through conducting a survey among 13 accredited hospitals in Lebanon.

2. Theoretical background

Developing countries have taken different approaches to ensure quality and improve standards of health-care services. Even though Lebanon is considered as the first country in the Middle East region to develop and employ accreditation standards in the health-care sector that are derived from the TQM philosophy, its impact on the service quality and employees’ involvement is still not clear enough (El-Jardali, Jamal, Dimassi, Ammar, & Tchaghchaghian, 2008).

Employees with enhanced INS are valuable for hospitals since they provide a culture of teamwork and participation which is essential for the innovation process. According to Dervitsiotis (2010), innovation is the organisation’s capability to generate new value through the combination of different attributes, mainly leadership, organisational culture, resources, customer participation and employees’ involvement. INS are acquired by nature, education, training and experience that employees accumulate during their career life (Toner, 2011).
Moreover, there is a need for each hospital to provide its employees with the necessary INS such as confidence to come out with innovative ideas; motivation, commitment and resilience to pursue that idea; leadership and dynamism to communicate their vision to others and drive it forward from concept to reality (Chell & Athayade, 2009).

According to Adler et al. (2003), one hospital might find that achieving innovation is a complex task while another hospital might incorporate it easily because it has staff with superior innovative skills. Thus, it is the organisational culture which determines the flexibility of hospitals to innovate. According to Kemenade (2012), soft TQM stands as a foundation for quality planning and creating a culture for CI which potentially leads to sustainable organisational success.

Different studies have shown the importance of soft TQM in developing the skills of employees (Abdallah, 2013; Abrunhosa & Moura, 2008; Aikens, 2011; Esain, 2012; Singh, Geetika, & Dubey, 2011). Hospitals need to create a supportive climate to encourage the skills and abilities of human resource as being the core competitive advantage. In addition, it is essential for hospitals to sustain their performance for the long term. This promotes people to innovate and minimises their fear from making mistakes.

Through the review of previous literature, many studies have focused on how TQM principles can influence innovation. For instance, Moreno (2011) examined the influence of quality management on orientation to innovation in service organisations while Hung, Lien, Yang, Wud, & Kuo (2011) studied the impact of TQM and organisational learning on the innovation performance in high-tech organisations. Particularly in the field of healthcare, Adler et al. (2003) studied the keys to accelerating performance improvement in hospitals through focusing on TQM practices. Similarly, Esain (2012) indicated the main policy implications and practicalities that are essential for health-care quality improvement in terms of TQM. Moreover, Kemenade (2012) focused on the soft skills for TQM and Singh et al. (2011) developed a theoretical framework for the soft dimensions of TQM to be implemented generally. In addition, service quality in health-care centres was empirically studied by Sumathi (2012). Hence, it is generally hypothesised that TQM in its soft side can positively influence the INS of employees in health-care organisations.

H1: Soft TQM has a significant and positive influence on INS.

The dimensions of soft TQM were adopted from Kanji’s business excellence model which acts as an improvement model that synthesises the concepts of TQM implementation as shown in Figure 1. The soft features related to PBM stand as a foundation for organisational management in quality planning and creating a culture for CI and therefore, it could lead to business excellence (Kanji, 2002).

PBM is the investment in training and development of workforce that empowers people to contribute to the organisational performance in decision-making and problem-solving. It tends to educate, train and empower employees to work in teams and eliminate the internal barriers that would prevent a hospital from having a culture of interactivity and learning. Different studies have focused on the importance of such practices in developing a culture of innovation and competitiveness such as Adinolfi (2003) who empirically studied the TQM practices among the public Italian and Irish hospitals. Similarly, El-Jardali, Merhi, Jamal, Dumit, & Mouro (2009) assessed the human resource management practices in Lebanese hospitals and focused on the significance of collaboration and sharing of knowledge among different hospital departments since employees cannot identify and solve the root causes of problems if they are not working in teams.

Hence, a second hypothesis is developed to examine the influence of PBM on developing the INS of employees in health-care organisations.
H2: PBM has a significant and positive influence on INS.

Furthermore, CI is incorporated with the daily TQM practices performed by employees to improve the quality of health-care services provided in response to the changing demands and technologies in this field (Anvari, Ismail, & Hojjati, 2011). If hospitals tend to sustain and advance their competitive position in the health-care market, it is essential to benefit from previous experiences and effectively use knowledge to continuously improve and innovate high-quality services (Hung, Lien, Fang, McLean, & Gary, 2010). As suggested by Yeh (2011), soft TQM is significantly related to organisation sustainability. Thus, improvement is not a one-time effort; it requires an organisational culture that regularly promotes people to innovate and minimises their fear of making mistakes (Abrunhosa & Moura, 2008). However, the process of CI could be limited due to several factors such as deficient human resource development programmes, lack of planning and leadership, and insufficient resources (Eleid, 2009). Therefore, the third hypothesis is developed to determine the influence of CI on developing the INS of employees in health-care organisations.

H3: CI has a significant and positive influence on INS.

Generally, many researchers found that TQM has a positive impact on innovation and particularly in developing the INS of employees at organisations (Abrunhosa & Moura, 2008; Prajogo & Sohal, 2006; Raphael, 2010). However, criticism has been raised regarding the effectiveness of TQM because of the resistance to change (Bäckström, Ingelsson, & Wiklund, 2011). Moreover, Zehir et al. (2012) discussed that some may consider TQM as an inhibitor of innovation because it can lead organisations to be narrow-minded and hinder the creativity of its employees.

Consequently, the aim of this paper is to study the implementation of soft TQM features such as PBM and CI in Lebanese hospitals and determine its impact on the INS of employees.

3. Methodology

In this research, a quantitative methodology was applied and a survey was conducted among public and private accredited hospitals from different provinces in Lebanon. The
target population was the health-care practitioners and employees working at hospitals. Only 13 hospitals agreed to participate in this survey in which the total number of employees was estimated to be 4964 based on data provided by the human resource department of each hospital. According to the formula of Dillman (2000), a sample size of 356 respondents would have been sufficient; however, 400 self-administered questionnaires were distributed randomly among the employees and health-care practitioners within the target hospitals in order to obtain a high response rate. Since most of employees work in shifts, it was essential to conduct this survey over a period of time (from March 2014 to May 2014), thus resulting in early and late responses.

Before conducting the survey, the questionnaire was pre-tested by both academic experts from the TQM field and health-care practitioners to evaluate and improve the quality of the instrument. Consequently, the questionnaire was refined and it was composed of 33 items in total; 15 for INS, 10 for PBM and 8 for CI, of which all items were derived from valid and reliable previous studies (Abrunhosa & Moura, 2008; Chell & Athayade., 2009; Crean, 2010; El-Jardali et al., 2008; Jonathan et al., 2012; Morris, 2008; Wang & Ahmed, 2004).

Based on a six-point Likert scale that ranged from (1) strongly disagree to (6) strongly agree, the respondents were asked to rate their level of agreement regarding the implementation of soft TQM and INS in their hospitals. Then, the data collected were analysed using the Statistical Package for Social Science (SPSS 19) and structural equation modelling (SEM) through AMOS 16 software.

4. Research findings and results

There was a high response rate to this survey (95%) in which 380 usable questionnaires were returned from the 400 originally distributed questionnaires and no missing values were detected. In addition, the non-response bias was assessed in which a T-test for Equality of Means was carried out indicating no distinct difference in values between the early and late respondents as shown in Table 1.

As for the demographic profile of respondents, 67.6% were females and 32.4% were males in which 51.8% of respondents were between 20 and 30 years old. Such results are expected since females are more dominating in health-care careers and the majority of employees are relatively of young age due to the high turnover in hospitals. Most of the respondents were qualified; 29.7% had a baccalaureate technique and superior

<table>
<thead>
<tr>
<th>Respondents</th>
<th>N</th>
<th>Mean</th>
<th>F</th>
<th>Sig.</th>
<th>t</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early</td>
<td>200</td>
<td>4.960</td>
<td>0.025</td>
<td>0.876</td>
<td>1.005</td>
<td>378</td>
<td>0.316</td>
</tr>
<tr>
<td>Late</td>
<td>180</td>
<td>4.880</td>
<td></td>
<td></td>
<td>1.002</td>
<td>369.49</td>
<td>0.317</td>
</tr>
<tr>
<td>STQM PBM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early</td>
<td>200</td>
<td>5.077</td>
<td>11.321</td>
<td>0.001</td>
<td>3.137</td>
<td>378</td>
<td>0.002</td>
</tr>
<tr>
<td>Late</td>
<td>180</td>
<td>4.772</td>
<td></td>
<td></td>
<td>3.091</td>
<td>330.07</td>
<td>0.002</td>
</tr>
<tr>
<td>CI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early</td>
<td>200</td>
<td>5.190</td>
<td>1.781</td>
<td>0.183</td>
<td>1.941</td>
<td>378</td>
<td>0.053</td>
</tr>
<tr>
<td>Late</td>
<td>180</td>
<td>5.022</td>
<td></td>
<td></td>
<td>1.920</td>
<td>345.91</td>
<td>0.056</td>
</tr>
</tbody>
</table>

Note: STQM, soft TQM.
technician diplomas followed by 23.9% with Bachelor’s degrees. Nurses had the highest rate of participation in this survey with 59.2% followed by 24.2% of administrative staff. Majority of the respondents (44.5%) had been working for less than five years at their corresponding hospital but in general, 37.4% of respondents had 5–10 years of experience in the field of health care.

The descriptive statistical results obtained from SPSS revealed that most of the respondents agree on the level of implementation of soft TQM (STQM) and their practicing of INS at hospitals since the average mean for each of the research variables was approximately five with standard deviation (SD) close to 1; INS (4.92, SD 0.770), PBM (4.93, SD 0.958) and CI (5.11, SD 0.845).

The collected data were evaluated through exploratory factor analysis in which validity of measures was detected (KMOINS = 0.884 and KMOSTQM = 0.893) and each set of items had loadings with its respective factor. In addition, a good level of internal consistency was measured using Cronbach’s alpha coefficient (0.837 < α < 0.909). Also, the results of composite reliability (CRINS = 0.709 and CRSTQM = 0.895) were accepted and greater than the 0.70 threshold as suggested by Hair et al. (2010).

In order to test the proposed hypotheses, the research variables were analysed through confirmatory factor analysis as a part of SEM analysis where validity and reliability of measures are illustrated in Table 2. Convergent validity of constructs was achieved since the measured items have factor loadings above 0.5. Also, the square root of average variance extracted (AVE) for each construct was found greater than inter-construct correlations and above the 0.5 threshold (INS, 0.617 and STQM, 0.72) proving that multicollinearity did not exist among the various constructs in the measurement model and hence discriminant validity is confirmed as suggested by Hair et al. (2010).

Table 2. Validity and reliability of the constructs.

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Items</th>
<th>L</th>
<th>AVE²</th>
<th>α</th>
<th>CR</th>
</tr>
</thead>
<tbody>
<tr>
<td>INS</td>
<td>TINS4</td>
<td>0.609</td>
<td>0.617</td>
<td>0.704</td>
<td>0.709</td>
</tr>
<tr>
<td></td>
<td>TINS6</td>
<td>0.722</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TINS7</td>
<td>0.586</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TINS11</td>
<td>0.537</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STQM</td>
<td>TPBM2</td>
<td>0.786</td>
<td>0.720</td>
<td>0.867</td>
<td>0.895</td>
</tr>
<tr>
<td></td>
<td>TPBM3</td>
<td>0.871</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TPBM4</td>
<td>0.746</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TCI3</td>
<td>0.668</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TCI4</td>
<td>0.751</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TCI5</td>
<td>0.58</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TCI6</td>
<td>0.631</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TCI7</td>
<td>0.689</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: L, loading; α, Cronbach’s alpha; and STQM, soft TQM.

Table 3. The goodness-of-fit results for the first- and second-order structural models.

<table>
<thead>
<tr>
<th>Goodness-of-fit thresholds</th>
<th>CFI &gt; 0.90</th>
<th>GFI &gt; 0.90</th>
<th>AGFI &gt; 0.90</th>
<th>TLI &gt; 0.90</th>
<th>RMSEA &lt; 0.08</th>
</tr>
</thead>
<tbody>
<tr>
<td>First-order model</td>
<td>0.95</td>
<td>0.954</td>
<td>0.930</td>
<td>0.945</td>
<td>0.053</td>
</tr>
<tr>
<td>Second-order model</td>
<td>0.975</td>
<td>0.962</td>
<td>0.942</td>
<td>0.968</td>
<td>0.044</td>
</tr>
</tbody>
</table>

Note: CFI, the comparative fit index; GFI, the goodness of fit index; AGFI, the adjusted goodness of fit index; RMSEA, the root mean square error of approximation; and TLI, Tucker Lewis index.
Moreover, the developed measurement model of the research achieved the goodness-of-fit indices after deleting 21 items that showed low factor loading and high modification indices, based on the suggested thresholds of Hair et al. (2006) which are illustrated in Table 3. This includes the comparative fit index (CFI), the goodness of fit index (GFI), the adjusted goodness of fit index (AGFI), the root mean square error of approximation (RMSEA), and Tucker Lewis index (TLI).

The model was developed according to first and second orders. As shown in Figure 2, the first-order structural model illustrates the dimensions of soft TQM mainly PBM and CI, in a direct relation to INS.

![Figure 2. First-order structural model.](image1)

![Figure 3. Second-order structural model.](image2)
Figure 3 shows the second-order structural model which reflects the direct relationship between soft TQM and INS. Both measurement models have achieved the goodness-of-fit indices as shown earlier in Table 3.

Furthermore, SEM was used through applying the bias-corrected (BC) bootstrap method since it provides unbiased estimates and produces more accurate confidence intervals at 95% (Cheung & Lau, 2008; Cribbie, 2012). The results are illustrated in Table 4.

Based on the second-order structural model, the standardised direct effect of soft TQM on INS is significantly different from zero at the 0.01 level ($p = 0.003$); hence $H_1$ is accepted. However, the first-order structural model showed diversity in results where the standardised direct effect of PBM on INS is significantly different from zero at the 0.05 level ($p = 0.034$) while the standardised direct effect of CI on INS is not significantly different from zero at the 0.05 level ($p = 0.240$). Therefore, $H_2$ is accepted and $H_3$ is rejected.

5. Discussion and conclusion

Basically, HTM is of particular value to health-care professionals who are concerned with developing skills and acquiring knowledge which influence their attitudes and willingness towards innovation.

Hospitals can develop HTM profiles for their employees in accordance with implementing their quality improvement strategies. The objective of this research was to determine the influence of soft TQM implementation on the INS of employees in Lebanese hospitals. There was a shift from focusing on the hard side of TQM towards focusing on its soft side since it is more related to the development of human resource skills.

The results obtained from this survey have shown a positive and significant influence of soft TQM on developing the employees’ INS. Such findings are consistent with previous literatures that have found a positive relationship between TQM practices and innovation performance (Prajogo & Sohal, 2006; Raphael, 2010).

For instance, it was stated that implementing TQM principles is advantageous for organisations that seek to improve the quality of their services and enhance a culture of innovation among their employees (Zehir et al., 2012). This can be achieved through empowering employees to identify the opportunities and improve the service quality while being integrated in training programmes (Young, Charns, & Shortell, 2001).

In addition, the results of this study have also confirmed the positive influence of PBM on developing the INS of employees. Many of the recent studies (Ismail, Khurram, & Jafri, 2011; Kemenade, 2012; Lewis, Pun, & Lalla, 2007; Raphael, 2010; Singh et al., 2011; Yeh, 2011) have emphasised the importance of implementing soft TQM values in
developing a culture of innovation within the organisation such as leadership, employee involvement, employee empowerment, training, teamwork, communication, customer focus, trust, collaboration, commitment, self-awareness, adaptability and problem-solving.

However, the findings of this research revealed that CI does not influence the INS of employees in Lebanese hospitals. Although this is contradictory to some previous studies (Moreno, 2011), it may be interpreted based on the fact that standardisation of procedures limits the capabilities of employees to innovate and controls them by its routine, especially in hospitals which are directed by the accreditation and standardisation protocols. Also, it can be related to work shifts and high employee turnover in hospitals. According to previous studies (El-Jardali, et al., 2009; Mouro, 2012), the quality of hospital care can be negatively influenced by the turnover and shortage in nurses which directly impacts the hospital’s ability in providing effective, efficient and safe care continuously.

It was claimed through some studies ((Adinolfi, 2003; Bäckström, Ingelsson, & Wiklund, 2011) that TQM is not the suitable instrument for promoting a culture of innovation. It can be used as a tool to identify the problems at workplace but it is not effective for innovation and transformation of procedures because of the resistance to change. Therefore, effective and proper management of health-care technology that is based on soft TQM values would highly contribute to improve the efficiency of health-care services and increase the outcomes of health-care organisations.

In conclusion, this research has empirically proved that soft TQM is a significant tool which can be used by health-care management to enhance the INS of employees through the successful implementation of PBM and it provides suggestions for the CI practices at hospitals. Although there was limited participation from the public hospitals in this survey, this research contributes to the health-care sector in Lebanon through providing empirical studies which can act as a ground for future studies. Also, the shift from the hard side to the soft side of TQM contributes significantly to the academic literature related to innovation and health-care quality as well as to the methodological part especially in terms of using SEM analysis. Thus, future studies are suggested to extend the research geographically and include more hospitals especially from public sectors.

Disclosure statement
No potential conflict of interest was reported by the authors.

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