An Empirical Investigation of the Relationship Between Quality Management Principles and Innovation in Industrial Companies in Jordan

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Abstract

This paper reports on research, which aimed to determine the degree of application of quality management principles and examine the link between these principles and innovation in the industrial companies in Jordan. Detailed survey responses from 54 participating companies were classified into three groups: high-, moderate- and low-level quality management implementation. Over 60% of these companies were classified as companies with moderate-level of quality management. Descriptive analysis of the survey responses found that the average of innovation scores for companies with high-level of quality management is larger than for those with moderate-level of quality management. Also, the average of innovation scores for companies with moderate-level of quality management is larger than for those with low-level of quality management. Correlation analysis demonstrated a statistically significant positive relationship between quality management principles and innovation.

Keywords: Quality Management Principles, Innovation, Jordan

Introduction

Management quality and innovation have become increasingly important. They are often considered as competitive advantages in domestic and international markets. As the industrial sector is considered to be one of the major contributors to the Jordanian economy, this analytical research aimed to determine the degree of application of the following quality management principles in industrial companies in Jordan: customer focus, leadership, involvement of people, process approach, system approach to management, continual improvement, factual approach to decision-making, and mutually beneficial supplier relationships. It also aimed to classify these companies into three groups: high-level quality management implementation,
moderate-level quality management implementation, and low-level quality management implementation. Also, this study aimed to investigate if relationships between quality management principles and innovation exist in these companies.

Conceptual Research Framework

Many manufacturing organizations have responded by using quality-based strategies to deal with tough competition.\(^{1,2}\) These organizations realize that many benefits are associated with providing products that possess high quality.\(^{3,4,5}\) The expected cumulative result for the organizations that successfully employ quality-based strategies is an improvement in profitability, productivity and competitiveness. Quality management principles have been promoted as an approach to management that enables organizations to become customer and quality focused.\(^{6}\) Almost in parallel to calls made for organizations to become quality focused, organisations have also been urged to become more innovative. Innovation, at the company level, involves applying ideas new to the firm in products, processes, services, organisations, management or marketing.\(^{7}\) The concept involves a lot more than conventional R&D, or even the application of technology. It covers a wide range of ideas-based improvement processes ranging from a few major discoveries or changes to a ‘million little thing’ which improve the operation of firms.\(^{7}\)

While organizations in the manufacturing industry generally understand the imperative for being innovative, developing a culture of innovation has been difficult for many.\(^{8}\) There is little consensus on the best and most practical approach to achieve an organization-wide innovation focus. The absence of an empirically validated and universally acceptable innovation implementation model is one of the factors that could be hindering the uptake of innovation in many organizations.

In the last decade, several genuine attempts have been made to determine the key constructs of quality management.\(^{9,10,11}\) As a result, there is a convergence of opinion that the quality management constructs are: sound top management leadership, strong customer focus, congenial relations with suppliers, harmonious employee inter-relationship, effective information/communication systems, benchmarking against competitors, and good management of processes and products. It is generally acknowledged that organizations need to be innovative in conducting their businesses to survive and prosper into the future. Some advocates of quality management have suggested that quality management principles provide the necessary organizational platform for inculcating innovation in organizations.\(^{12}\) Theoretically, quality management principles, such as: focus on customer satisfaction, leadership, involvement of people, process approach, system approach to management, continual improvement, factual approach to decision-making, and mutually beneficial supplier relationships, appear to
enable organizations to develop a culture of innovation. There are many common aspects between quality management principles and innovation. They both emerged as partial answers to the intense competitive pressure that industrial sector organizations are facing. Some of quality management principles and innovation are similar. For example, continual improvement is a key feature of quality management and innovation.

It is established that there are no local studies conducted in Jordan to investigate the relationships between quality management principles and innovation. A clear need existed for empirical studies that link quality management principles and innovation using appropriate analytical methods. This research examines the link between all recognised quality management principles and innovation. The quality management principles are: customer focus (CF), leadership (L), involvement of people (IOP), process approach (PA), system approach to management (SATM), continual improvement (CI), factual approach to decision-making (FATDM), and mutually beneficial supplier relationships (MBSR). Eight hypotheses were developed and tested to investigate if there are relationships between the indicated quality management principles and innovation:

1. H0: there is no statistically significant relationship between customer focus (CF) and innovation.
2. H0: there is no statistically significant relationship between leadership (L) and innovation.
3. H0: there is no statistically significant relationship between involvement of people (IOP) and innovation.
4. H0: there is no statistically significant relationship between process approach (PA) and innovation.
5. H0: there is no statistically significant relationship between system approach to management (SATM) and innovation.
6. H0: there is no statistically significant relationship between continual improvement (CI) and innovation.
7. H0: there is no statistically significant relationship between factual approach to decision-making (FATDM) and innovation.
8. H0: there is no statistically significant relationship between mutually beneficial supplier relationships (MBSR) and innovation.

The population of the study consists of all Jordanian shareholding companies listed under the industrial category in Amman Stock Exchange. In late 2001, this consisted of a total of 89 companies. This study focused on Jordan because its small size provides an excellent study of the relationship between quality management principles and innovation in industrial sector.
This sector was chosen because there is a clear trend in the social and economic development plans of successive Jordanian governments to support the industrial sector. The companies in this sector provide significant local employment, and increasing national income. The contribution of the industrial sector to Gross Domestic Product (GDP) at constant factor cost reached 19.8% in 2002, against 15.4% in 1993. Industrial exports increased from JD 551,249,000 in 1993 to JD 1,387,100,000 in 2002. Industrial exports constituted about 90.2% of total domestic exports in 2000 against 79.7% in 1993.\(^{14,15}\)

**Methodology**

Quantitative data were collected (through survey questionnaire) and analysed in order to fully investigate the relationship between quality management principles and innovation. A comprehensive quality management measurement survey questionnaire was developed on the bases of the ISO 9000:2000 quality systems standards.\(^{13}\) The survey questionnaire consisted of two parts. Part One provided some background information about industrial companies in Jordan, such as: the industrial sector and number of employees. Part Two provided information about quality management principles and innovation: customer focus (8 questions), leadership (7 questions), involvement of people (8 questions), process approach (6 questions), system approach to management (6 questions), continual improvement (8 questions), factual approach to decision-making (6 questions), mutually beneficial supplier relationships (5 questions), and innovation (8 questions). Innovation has been measured through the questions on: the innovation aspect within the corporate vision and culture, innovative products, innovative services, innovative processes, research and development efforts, and the rates of innovation of new products, services and processes. Four-point Likert scales (strongly agree; agree; disagree; and strongly disagree) were used in formatting the questionnaire. The final format of the questionnaire was developed, trailed, modified and then distributed to quality managers (or managers who are responsible for quality) in industrial companies in Jordan.

The face validity of the questionnaire was ensured through a pilot testing of the survey questionnaire. Ten copies of the questionnaire were distributed to quality experts in industrial corporations in Jordan. The format of the questionnaire was modified according to their comments and suggestions. The questionnaire included few check questions to ensure objectivity of the responding managers in the completion of the questionnaire. Correlation of means (R>0.83) and significance t-test checks showed no significant difference between responses for the internal check questions. Therefore, the internal validity of the questionnaire is high. Some questions were also stated in negative form. All quality managers in industrial companies were initially phoned to seek their participation in the study. 54 managers agreed to participate in the completion of the
questionnaire (the response rate was 60%). Few managers mentioned that their companies were still in the early establishment stage and did not consider themselves ready to participate. Other managers did not accept to participate in the survey, primarily because they did not have the time to participate.

The reliability of the questionnaire was tested according to Cronbach Alpha formula. The reliability coefficient (Alpha) of each quality management principle was as follows: customer focus (91.43%), leadership (94.85%), involvement of people (94.70%), process approach (92.23%), system approach to management (92.95%), continual improvement (93.48%), factual approach to decision-making (92.48%), and mutually beneficial supplier relationships (93.68%). The reliability coefficient of innovation was (95.70%). In general, the reliability coefficients are good, which mean the overall reliability of the questionnaire is high.

Through careful analysis of survey responses, the participating companies were classified into three groups: high-level quality management implementation, moderate-level quality management implementation, and low-level quality management implementation. For example, the companies were classified into: high, moderate and low levels of customer focus (CF) (one of the eight quality management principles investigated) as follows:

- For each company, calculate the average of the responses to all the questions related to this principle (CF).
- For all companies, calculate the mean value (μx) and the standard deviation (σx) value of all the averages related to this principle.
- For each company:
  (a) If the average of the responses is larger than the mean value of all the averages (μx) by more than one standard deviation (1 σx), that company is considered “high customer-focused organization”.
  (b) If the average of the responses is larger/smaller than the mean value of all the averages (μx) by at most one standard deviation (1 σx), that company is considered “moderate customer-focused organization”.
  (c) If the average of the responses is smaller than the mean value of all the averages (μx) by more than one standard deviation (1 σx), that company is considered “low customer-focused organization”.

In the same way, the companies were classified according to all other quality management principles. Data analysis was based on descriptive statistics analysis (Frequencies and means) and inferential statistics (t-test,
analysis of variance (ANOVA), and correlation). Hypotheses were tested using correlation analysis.

**Results**

The distribution of the companies according to the classification of high, moderate and low level of each quality management principle is shown in *Figure 1*. The majority of companies showed a moderate level of each quality management principle. Most of the moderate-level companies were larger companies (greater than 100 employees), and included many from the chemical, construction, food & drinks, and paper & packaging industries. The majority of high-level companies were from chemical and construction industries, whereas the majority of low-level companies were from the engineering, clothes & textile, and pharmaceutical industries.

![Figure 1: Distribution of the Companies (%) according to the Classification of High, Moderate and Low level of Each Quality Management Principle](image)

For each principle of quality management, the average of innovation scores was calculated for high-, moderate-, and low-level companies. The average of innovation scores for companies with high, moderate, and low levels of quality management is shown in *Figure 2*. The average of innovation scores for companies with a high level of each principle of quality management is larger than for those with moderate level of each principle of quality management. Also, The average of innovation scores for companies with a moderate level of each principle of quality management is larger than for those with low level of each principle of quality management.
Figure 2: The Average of Innovation Scores for Companies with High, Moderate and Low Levels of Quality Management Principles

The differences of averages between high-, moderate-, and low-quality companies for all principles using analysis of variance (ANOVA) produce significances of F-values < .001. This confirms that there is a statistically significant difference between the average of innovation scores for groups of companies classified as high, moderate, and low for each principle of quality management.

Correlation analysis was used to determine the nature and the strength of the association between the eight quality principles and innovation. Results of correlation analysis between quality management principles and innovation for all companies are shown in Table 1. These results show that correlation is significant at the “0.001” level (2-tailed). This means that all the null hypotheses mentioned above, in the conceptual research framework section, were rejected. This indicates that there is a statistically significant positive relationship (association) between quality management principles and innovation.

Table 1 Results of Correlation Analysis between Quality Management Principles and Innovation

<table>
<thead>
<tr>
<th>Quality Management Principles</th>
<th>Pearson Correlation</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer focus</td>
<td>.932</td>
<td>.000</td>
</tr>
<tr>
<td>Leadership</td>
<td>.988</td>
<td>.000</td>
</tr>
<tr>
<td>Involvement of people</td>
<td>.931</td>
<td>.000</td>
</tr>
<tr>
<td>Process approach</td>
<td>.986</td>
<td>.000</td>
</tr>
<tr>
<td>System approach to management</td>
<td>.916</td>
<td>.000</td>
</tr>
<tr>
<td>Continual improvement</td>
<td>.975</td>
<td>.000</td>
</tr>
<tr>
<td>Factual approach to decision-making</td>
<td>.990</td>
<td>.000</td>
</tr>
<tr>
<td>Mutually beneficial supplier relationships</td>
<td>.907</td>
<td>.000</td>
</tr>
</tbody>
</table>
In general, the results of data analysis indicate that there is a strong positive relationship between each principle of quality management and innovation. This means that the changes in innovation were related to the changes in the degree of application of quality management principles. Therefore, the implementation of quality management principles is positively associated with innovation. The findings suggest that companies that implement quality management principles well could also be more innovative than companies that do not. Thereby, it can further be implied that quality management principles can be a vehicle that companies use to become innovative.

The principles of quality management investigated in this study represent the best way to provide the employees with information, knowledge, power and rewards to encourage them to be more skilled, committed, productive and innovative. This means that the practical application of quality management principles leads to inspiring employees to succeed and grow, which then improve their performance and innovativeness. The strong positive relationship between quality management principles and innovation supports the argument that the adoption of quality management principles provides the necessary organizational platform for inculcating innovation in companies.

Conclusion

Results of descriptive analysis indicate that there are statistically significant differences between the average of innovation scores for groups of companies classified as high, moderate, or low for each principle of quality management. Results of correlation analysis show that there are positive relationships between quality management principles and innovation. This reflects the importance of the adoption of quality management principles as an excellent foundation for developing a culture of innovation. These conclusions have been supported by previous research findings, already indicated.

Implications

The research has a significant implication for the development of a theoretical base for application of quality management principles in Jordanian industries. One of the main implications of this research is summarized in identifying eight quality management principles that are used to differentiate between high-quality management, moderate-quality management, and low-quality management companies. These principles are: customer-focused organizations, leadership, involvement of people, process approach, system approach to management, continual improvement, factual approach to decision-making, and mutually beneficial supplier relationships.

Companies must be aware of the following requirements for successful quality management implementation:
• Understand current and future customer needs, meet customer requirements and strive to exceed customer expectations, and to be responsive to fixing and resolving customer problems and complaints.

• Establish unity of purpose and direction of the organization and develop a long-term relationship of loyalty and trust with the employees.

• Encourage employees to be involved in decision-making and empower them through delegating authority to make decisions regarding their work.

• Manage activities and related resources as a process.

• Identify, understand and manage interrelated processes as a system.

• Continual improvement of the company's overall performance should be a permanent objective of the company.

• Decision-making should be based on the analysis of data and information.

• The company and its suppliers are interdependent, and a mutually beneficial relationship enhances the ability of both to create value.

Based on the empirical evidence linking the principles of quality management and innovation, the findings of this study have several important implications. The findings indicate that innovation scores for all companies in the high-quality group were significantly larger than for those in the moderate-quality group. The results also indicate that the mean of innovation scores for all companies in the moderate-quality group were significantly larger than for those in the low-quality group. There is a clear message for managers that the practical application of the quality management principles is associated with high rate of innovation. Results of correlation analysis show that there are strong positive relationships between the principles of quality management and innovation. Results suggest that the adoption of quality management principles is critical to develop a culture of innovation among organization members.

Contribution to the Literature

The study adds to the literature by developing a quality management framework. This framework illustrates the relationship between quality management principles and innovation. The study makes significant contributions in extending the methods and techniques used to determine the degree of application of quality management principles, and through the examination of the link between quality management principles and innovation. The findings are considered to make significant contribution in terms of creating awareness and understanding of quality management principles. This research also contributes by presenting very useful
implications and recommendations for Jordanian industrial companies to properly adopt quality management principles and improve their innovative capabilities. The implications of the study may also be useful for the Jordanian government in their efforts to encourage and support companies to apply quality management principles and practices to improve their innovativeness; in the long run, this improves the performance of the Jordanian economy. These implications might also be useful for the governments of other developing economies.

 مدى تطبيق مبادئ إدارة الجودة والعلاقة بين هذه المبادئ، والإبداع في الشركات الصناعية في الأردن

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ملخص

هدفت هذه الدراسة إلى التعرف على مدى تطبيق مبادئ إدارة الجودة والعلاقة بين هذه المبادئ، والإبداع في الشركات الصناعية في الأردن. وقد تم تحليل البيانات المجمعة من 54 شركة بحيث تم تصنيف هذه الشركات في ثلاث مجموعات: شركات ذات مستوى عالي من إدارة الجودة، شركات ذات مستوى متوسط من إدارة الجودة، وشركات ذات مستوى من إدارة الجودة. لقد شكلت الشركات ذات المستوى المتوسط من إدارة الجودة ما نسبته 60% من مجموع الشركات المستجيبة. وبناءً على النتائج التحليل الإحصائي للبيانات أن مستوى الإبداع في الشركات ذات المستوى العالي من إدارة الجودة أعلى منه للشركات ذات المستوى المتوسط من إدارة الجودة. كذلك وجد أن مستوى الإبداع في الشركات ذات المستوى المتوسط من إدارة الجودة أعلى منه للشركات ذات المستوى المنخفض من إدارة الجودة. وقد أشارت نتائج تحليل الارتباط إلى وجود علاقة طرية ذات علاقة إحصائية بين مبادئ إدارة الجودة والإبداع.
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