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The Moderating Role of Knowledge Management on the Relationship between Information Technology and Total Quality Management: The Case of the Public Hospitals in Saudi Arabia

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Abstract: The current study aims to examine relationship between information technology and total quality management in the public healthcare sector in Saudi Arabia. Moreover, the moderating effect of the moderating effect of knowledge management on the relationship between information technology and total quality management. The research design of the current study is quantitative using random sampling methods to choose respondents. In the data collection process 259 questionnaires were distributed among the respondents, while 165 questionnaires were received. Out of 165 questionnaire only 154 were found useful for further analysis. The results of the analysis showed that there is direct relationship exist between information technology and total quality management but knowledge management does not moderate the relationship between information technology and total quality management.

Key words: Total quality management, information technology, knowledge management, partial least squares, public healthcare, relationship

INTRODUCTION

Most developing countries including Saudi Arabia, have started to focus the attention on the quality of health services and acquiring new knowledge, information, equipment and techniques. However, having these things is not enough to create health services with good quality. It is therefore, necessary to prepare management staff who are capable of understanding the essence of quality of services and who are capable of creating databases and information systems and also capable of abandoning cultural challenges that hinder the improvement of health services (Aljunid, 1995).

The government of Saudi Arabia has been putting in enormous efforts to reform the Saudi public hospitals and solid advancements have taken place. In the context of health sector, Almalki *et al*. (2011) declared that Saudi government have given much priority to the health care services. In the past few decades in terms of the quantity and quality of health care services witnessed great improvements. To meet the challenges face by the healthcare system and to improve the quality of services provided by health care, the Saudi Ministry of Health (MOH) has established a national level strategy that focuses on diversifying funding resources, developing new ways to enhance performance of healthcare services. Despite the many achievements done, the Saudi health services, particularly the Saudi public healthcare sector still encounter tremendous obstacles and challenges. Such challenges include for example human resource development and distinction in the multiple roles of the MOH which include financing, provision, control and supervision of health care delivery. Other challenges that the Saudi public healthcare sector is still encountering is diversifying its financial sources; integrating the Cooperative Health Insurance (CHI) an effective management processes of chronic diseases; establishing an effective national health information system such as the implementation of e-Health information systems, human resource development, activating the supervision and monitoring role of the MOH over health services (Almalki *et al*., 2011).

As far as TQM is concerned, a number of factors have been hypothesised to influence its effective implementation and practices. One of the main factors that have been addressed to influence TQM practices is the

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construct of information technology. The importance of information technology as a determinant factor of TQM has been addressed by Adeoti (2011) who stated that information technology put in place in the hospitals is an important factor that must be considered for effective implementation of total quality management. Adeoti (2011) further elaborates that it is important that institutions utilise information technology as a tool to develop a sense of learning and acquiring knowledge. In the Saudi public healthcare context and despite the availability of technological materials and devices, there does not seem to be an effective implementation of these devices inside the hospitals, particularly in facilitating the communications between the hospitals and the patients. Recommendations to include information technology as a determinant factor of TQM was given by Silaf and Ebrahimpour who conducted a study that attempted to examine and compare some of the critical factors that affect total quality management practices across countries. Thus, realising the critical importance information technology plays in the effective implementation of TQM practices and the moderating effect of KM, the present study attempts to examine the relationship between formation technology public hospitals in Saudi Arabia and the impact of information technology on TQM practices and this relationship in the context of the moderating effect of KM. This is important in the Saudi healthcare sector taking into account that while the Saudi government allocates huge budget for latest technologies and machines in the healthcare sector, the use of this technology has been reported to be way less that what the government expected and promoted and this would negatively influence the provision of quality in the hospitals. This current study tends to examine the moderating effect of knowledge management on the relationship between information technology and TQM practices in the public hospitals in Saudi Arabia.

Total quality management: Total quality management in organization can be defined in different practices such as visionary leadership organizational and individual educative development internal and external bilateral accomplishments, empowering and satisfying the manpower and workforces that can be considered as associated policies. Monitoring the collaboration between costumer's convenient generating factors and organisational services under a constant evaluation can be considered as visionary leadership.

Considering the worldwide popularity of total quality management when it comes to healthcare policies and developments, however myriad of perspectives and achievement guidelines create uncertainty of defining a universal policy of TQM in healthcare. Reeves and Bednar (1994) believe that absence of a global definition for present TQM around the world is one of the main factors of this ambiguity whereas yet in some areas there are considerable mode of policies of that they can be concluded as global inspirations for TQM. Dean and Bowen (1994) believe that total quality management universal guidelines can be subcategorized into three major mainstreams to be capable of being conducted around the globe. Customer as the most prior factor in healthcare services can be acknowledged as the first and most significant category. Constant evaluation and investigating every involved aspect of TQM in favour of escalating the value of healthcare in developing quality by continues examining the technical and administrative procedure can be suggested as the second most significant category in this theory in order to achieve enhanced methods. Unremitting co-operation between customer and provider as well as bilateral interactions between managers and employees can be considered as the third most important category of TQM in healthcare productions and services. A number of researchers addressed these principles in their research studies stating how important these principles are for the overall implementation of TQM.

Boone (1991) mentioned that last few decade the technology and information technology advancement bring positive impact on business and daily communication pattern. Information technology has been defined as an umbrella that includes various hardware, software and service packages enables the collection, storage and retrieval of communication information. IT have been considered as "enabler" to business functions in organisation. Those organisation trying to expand the level of intelligence is not based in the intelligence or the mental power of their members but on the basis of those tools, equipment's and methods help organisation to expand the thinking process of their members. The "thinking" is a process of gathering information from different resources, extracting the relevant and relate in a creative way to introduce or deduce new ideas.

Information technology: Processed and transmitted digital form of data such as text, sound and pictogram information can be defined as major compartment of information technology which is driven by computers and telecommunication hardware and software (Siam *et al.*, 2012). Quality management is directly influenced by IT applications which can result in increasing quality management development (Khanam *et al.*, 2016). This matter can be detected on organisations devoted budget and expends increasing ration to purchase more computing technologies. Researchers describe this intention of companies to be equipped with IT technologies has created the IT market movement to develop economical business plan for popularising IT products in every office and organisations more than before (Almashaqba, 2012). Research on the

organisational role of IT posited a forceful role of this predictor in enhancing the way tasks are carried out by employees along a firm's power structure and facilitating change toward more effective and efficient practices.

Knowledge management: Knowledge Management (KM) refers to the way of handling social affairs, controlling and communicating worker's learning capital through association. Learning in this way helps organizations to improve current business practices, bring efficient, powerful standards and methods to uproot excess methods. KM serves as an optimised and more community oriented way helps organisations and individual to synchronize the way of creativity, foster the process of learning by effective utilization of an endeavour's learning resources. In organisation KM has become an essential need for all size of organisation either small, medium or large. Catching an organization's most important knowledge (resource) and dispersing it viably over the undertaking is a business discriminating issue for some help work area, client backing and IT divisions.

Research framework and hypothesis development

Information technologies-TQM link: Information Technologies (IT) are associated with the successful deployment of TQM (Davenport *et al.,* 1993; Hitchner, 1993) (Fig. 1). IT as a managerial concept evolved from a reengineering tool to a strategic resources-based approach in the pursuit of TQM implementation. The utilisation of IT tools as a function of quality performance has its presence along various industries and across firms of different sizes and capacities (Stoddard *et al.,* 1996; Candler *et al.,* 1996). Scholarly research associate the employment of IT tools with the achievement of the aforementioned objective (Stebbins *et al.,* 1998). Hence, IT tools provide firms with the flexibilities required to carry out the redesign of process in order to pursue TQM. Extrapolating on Barney (1991)'s, assessment and in reconciliation with Schuler's theory, the previous notion is resulted from the ability of improvement of information capabilities through the utilisation of modern IT tools given that such capabilities were not available in previous settings; though such capabilities are associated with the enforcement of TQM (Morrison, 1997). In this sense, IT capabilities are believed to enhance employees efficiency and effectiveness, eliciting positively TQM practices and thereby, the profitability of an organisation (Kohli and Hoadley, 2006). As such, a numerous studies acknowledge the implication of IT's investment of an organisation on the quality of employees performance and the ease of TQM implementation (Ramirez *et al*., 2010). Taken altogether, the researcher posits that IT is associated with TQM.

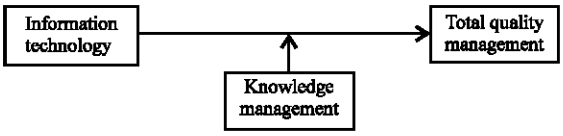

Fig. 1: The research framework

- H_1: information technologies is positively associated with TQM practices

On the bases of contingency theory and resources-based view (Barney, 1991) and building on scholarly arguments (Cooper *et al.,* 2000; Melville *et al.,* 2007; Kohli and Hoadley, 2006; Ramirez *et al*., 2010) the direct relationship between IT and TQM was proposed. That is say, IT is positively associated with TQM practices. Nevertheless, the literature argues that knowledge management is a necessary precondition for IT infrastructure to be performed in an effective manner (Gupta and Govindarajan, 2000; Karlsen and Gottschalk, 2004). The existence of proper knowledge management is believed to ease and facilitate multidirectional communications between business units (Lindner and Wald, 2011). Moreover, IT infrastructure has a critically positive influence on storing and retrieving relevant knowledge in terms of time and cost (Bresnen *et al*., 2003) and thus, it is thought to improve TQM implementation (Leseure *et al*., 2004; Sapsed *et al*., 2005). Previous research studies indicates a significant positive effect of knowledge management on the relationship between IT and TQM practices (Lindner and Wald, 2011). Taken altogether, the next hypothesis is conceptualised:

- H_2: knowledge management moderates the positive relationship between IT and TQM practices

MATERIALS AND METHODS

Measurement and instrumentation: The questionnaire tool used to measure the constructs of the current study are selected carefully with the help of previous literature. The measure of information technology have been taken from the study by Lakhal *et al.* (2006) and for the total quality management have been adopted from the research of from Demirbag. Finally, knowledge management measurements adapted from Zheng *et al*., Kamran and Sabir's.

Population and sample: The population of the current study consist of 259 hospitals operating currently, in Saudi Arabia as per the Health Statistical Year Book in 2012. Simple random sampling method was used to collect the data for the current study to test the developed

hypothesis. Simple random sampling used as probability technique to draw sample from the list of beneficiary hospitals in Saudi Arabia. A total 259 questionnaires were distributed among the respondents of the current study, only 165 returned the questionnaire. In the questionnaire screening only 154 found useful for the further analysis based on the completeness and usefulness. To test the proposed model of this current study, Partial Least Squares Structural Equation Modelling (PLS-SEM) approach was employed utilizing the SmartPLS Package 2.0.

The measurement model: In first step of the measurement model, validity and reliability have been confirmed using the Partial Least Square Structural Equations Modelling (PLS SEM). The SmartPLS 2.0 package was used.

The measurement model of this current study was assessed using the PLS-SEM before testing the proposed hypothesis. In the analysis two steps were followed in order to assure the goodness of fit of the proposed research model needed to be tested. In the first step construct validity was assessed which includes scores of factor loadings, composite reliability, Cronbach's alpha and convergence validity. The criterion by Fornell and Larcker (1981) criterion have been used to assess the discriminant validity of the constructs.

Construct validity of the measurements: Construct validity is the ability of the items generated to measure some constructs appropriate enough to serve the purpose of measuring the concept for which it was designed (Hair, 2009). In addition to that, the items designed to measure specific construct should have higher loadings on their respective constructs rather than on other construct. In this current study to ensure that there should be no issue of validity, a comprehensive literature have been reviewed to select the item that have already tested and reported with high level of validity by previous researchers. The items were assigned correctly to their respective constructs on the basis of factor analysis results. The items of the constructs showing higher loadings on the specific constructs and all items were significantly loaded on their respective constructs.

Convergent validity of the measurements: Composite reliability of the constructs used in the current study are ranges from 0.817-0.944. The values calculated in this current study are higher than recommended benchmark of 0.70 provided by Fornell and Larcker (1981) and Hair (2010). The values of the Average Variance Extracted (AVE) ranges between 0.535 and 0.781 which indicates appropriate level of construct validity for the tool employed in the current study (Barclay *et al*., 1995). The results of convergent validity of constructs assured the convergent validity of the outer model (Table 1).

Table 1: Loading convergent validity

Variables/Items	Loading	AVE	Composite reliability	Cronbach's alpha
Customer focus				
CF1	0.806	0.565	0.885	0.846
CF2	0.681			
CF3	0.646			
CF4	0.754			
CF5	0.802			
CF6	0.803			
Continuous improvement				
CI1	0.886	0.781	0.914	0.859
CI2	0.893			
CI3	0.871			
Information and analysis				
IA1	0.836	0.701	0.933	0.914
IA2	0.871			
IA3	0.886			
IA4	0.855			
IA5	0.826			
IA6	0.741			
Information technology				
T1	0.827	0.675	0.935	0.919
IT2	0.753			
IT3	0.774			
IT4	0.822			
IT5	0.817			
IT6	0.880			
IT7	0.869			
Knowledge management				
KM1	0.760	0.592	0.941	0.931
KM10	0.707			
KM11	0.767			
KM2	0.803			
KM3	0.741			
KM4	0.756			
KM5	0.761			
KM6	0.762			
KM7	0.740			
KM8	0.766			
KM9	0.886			
Process management				
PM2	0.835	0.596	0.898	0.864
PM3	0.774			
PM4	0.784			
PM5	0.659			
PM6	0.771			
Role of the quality department				
RD1	0.849	0.625	0.892	0.849
RD2	0.860			
RD4	0.821			
RD5	0.758			
Strategic quality planning				
SP1	0.796	0.622	0.919	0.896
SP2	0.896			
SP3	0.835			
SP4	0.889			
SP5	0.786			
SP6	0.599			
SP7	0.673			
Training and education				
TE1	0.926	0.809	0.944	0.921
TE2	0.890			
TE3	0.908			
TE4	0.872			
Teamwork and involvement				
TI1	0.515	0.535	0.817	0.710
TI2	0.813			
TI3	0.764			
TI4	0.794			

[a]Composite Reliability (CR) = (Σ factor loading)^2/{(Σfactor loading)^2)+Σ (variance of error)}; [b]Average Variance Extracted (AVE) = Σ (factor loading)^2/(Σ (factor loading)^2+Σ (variance of error)}

Table 2: Discriminant validity

Variables	CF	CI	IA	IT	KM	PM	RD	SP	TE	TI
Customer focus	0.751									
Continuous improvement	0.751	0.883								
Information and analysis	0.766	0.737	0.837							
Information technology	0.783	0.764	0.784	0.821						
Knowledge management	0.662	0.707	0.574	0.731	0.769					
Process management	0.758	0.761	0.772	0.785	0.649	0.772				
Role of the quality department	0.682	0.620	0.637	0.666	0.583	0.761	0.790			
Strategic quality planning	0.812	0.797	0.826	0.798	0.645	0.800	0.661	0.789		
Training and education	0.703	0.714	0.742	0.755	0.634	0.751	0.531	0.853	0.899	
Teamwork and involvement	0.716	0.573	0.535	0.540	0.434	0.491	0.630	0.603	0.521	0.731

Table 3: Prediction relevance of the model

Constructs	R^2	Cross-validated redundancy	Cross-validated communality
TQM	0.758	0.366	0.502

Table 4: Hypothesis testing

Hypothesis	Path coefficient	SE (STERR)	t-values	p-values	Decision
IT ->TQM	0.694	0.077	8.970	0.000	Support
KM ->TQM	0.189	0.069	2.721	0.003	Support
IT*KM->TQM	-0.056	0.047	1.186	0.118	Not support

Discriminant validity of the measures: In order to test the discriminant validity for the measurement tool employed in this current study, method developed by Fornell and Larcker (1981) has been used. The square root of Average Variance Extracted (AVE) of all constructs is placed on the diagonal of the correlation matrix. As the diagonal values of the elements were higher other elements in the rows and columns in which they are located, this process ensures that the discriminant validity of the outer model. The details of the AVE is given in Table 2.

Prediction relevance of the model: The results of prediction relevance of the model indicates that the cross-validated redundancy of TQM is 0.336 while the cross-validated community is 0.502. As per the criterion by Fornell and Cha the values greater than zero indicates that an adequate predictivity of the tested model. The details are given in Table 3.

Hypothesis testing: After assessing the goodness of fit of the measurement model is good, the proposed hypothesis for the study have been examined. The proposed hypothesis have been tested using SmartPLS 2.0 and running PLS Algorithm. The path coefficient of the models have been generated as illustrated with the help of Fig. 2 and 3.

Information technology has a positive and significant effect on total quality management at the 0.001 level of significance ($\beta = 0.694$, $t = 8.970$, $p<0.001$) and knowledge management has a positive and significant effect on total quality management at the 0.001 level of significance

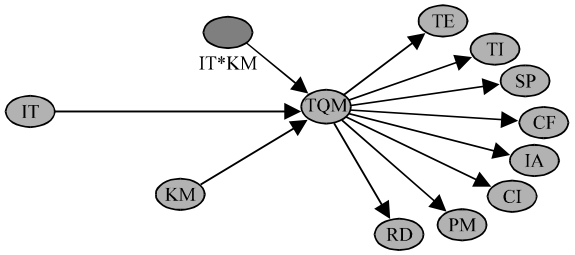

Fig. 2: The research framework for IT and KM

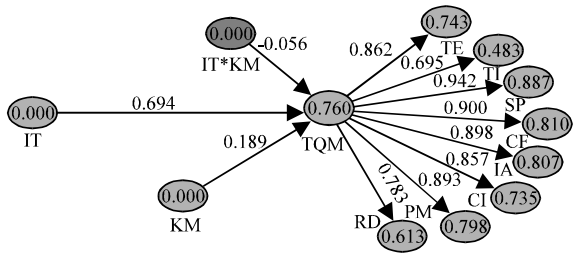

Fig. 3: Path model results

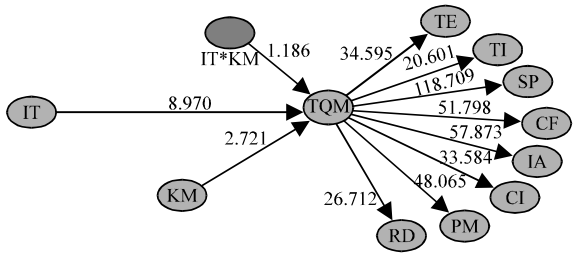

Fig. 4: Path model significance results

($\beta = 0.189$, $t = 2.721$, $p<0.001$) as indicated in Fig. 2 and 3 and Table 4. Finally, knowledge management has no moderating effect on the relationship between information technology and total quality management at the 0.001 level of significance ($\beta = -0.056$, $t = 1.186$, $p>0.01$). From the results of the current study it is cleared that only H_1, H_2 were supported but H_3 was not supported. This findings stressed the importance of information technology and knowledge management on total quality management of the public healthcare sector in Saudi Arabia (Fig. 4 and 5).

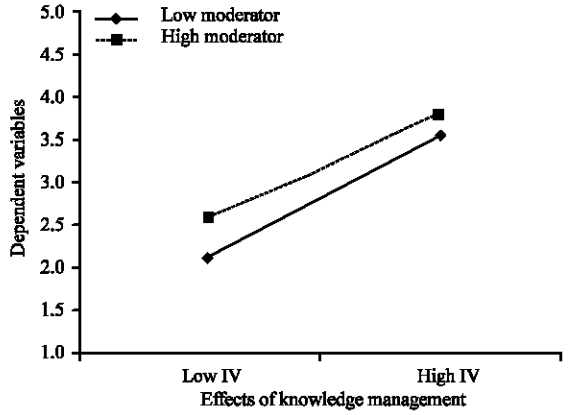

Fig. 5: The moderating effect of knowledge management on the relationship between information technology and total quality manangement

RESULTS AND DISCUSSION

The main aims of the current research was to examine the relationship between information technology and total quality management of the public healthcare sector in Saudi as well as to examine the moderation effect of knowledge management in the mentioned relation. The finding was supported the direction relationship and the indirect relationship of moderation effect was not supported. The public healthcare sector in Saudi Arabia has been experiencing many challenges in the quality of the services provided. In this context, the Rncos stated that despite being amongst the most lucrative markets in the world, the Saudi healthcare market faces a number of challenges. One of the biggest challenges is the lack of human resources. Around 80% physicians and more than 79% nurses working in the country are of Foreign origin and have a very high turnover rate. The report also addressed other challenges that included the lack of skilled workers in the Saudi public healthcare sector, bureaucracy, being practiced in the Saudi public healthcare providers.

In the current study the relationship between information technology and TQM was support as in hypothesis 1. For long, scholars argued and supported that relationship (Zadrozny and Ferrazzi, 1992; Cortada, 1995). For instance, Sobkowiak and LeBleu (1996) and Pearson *et al.* (1995) espoused the central role of IT in improving the deployment of TQM practices. Though, it is noteworthy that in the pursuit of emphasising the critical influence of IT over the success of TQM implementations, the applications of IT along various spectrum of the aforementioned were designated (for review, Aiken *et al.*, 1996; Kaplan, 1996; Kock and McQueen, 1997; Counsell, 1997). In process of assessing the moderating effect of knowledge management, on the relationship between information technology on total quality management of the public healthcare sector in Saudi, the results of data analysis does not confirmed the proposed hypothesis which is hypothesis 2. Knowledge management reflects "a systematic and integrative process of coordinating organization-wide in pursuit of major organizational goals". It is argued that the practices of knowledge management have to fit the organisational context of TQM in order to establish a competitive edge. Organisational research posits an indirect role for knowledge management over a number relationships. The findings from this research study might be very useful for the researcher, academician and health care practitioner to make their services more compatible and gain success in the industry by knowing the factors that can influence their relationship with their partners.

CONCLUSION

These results might be useful for the academicians, researcher and public health sector institute concerned about the compatibility and success in health sector by maintaining good relationship with their customers and corporate partners.

REFERENCES

Adeoti, J.O., 2011. Total quality management (TQM) factors: An empirical study of Kwara state government hospitals. Ethno. Med., 5: 17-23.

Aiken, M., B. Hasan and M. Vanjani, 1996. Total quality management: A GDSS approach. Inf. Syst. Manage., 13: 73-75.

Aljunid, S., 1995. The role of private medical practitioners and their interactions with public health services in Asian countries. Health Policy Plann., 10: 333-349.

Almalki, M., G. Fitzgerald and M. Clark, 2011. Health care system in Saudi Arabia: An overview. Eastern Mediterr. Health J., 17: 784-793.

Almashaqba, Z.M., 2012. Evaluation the role of information technology in business value performance (BVP). Interdiscip. J. Contemp. Res. Bus., 4: 404-420.

Barclay, D., C. Higgins and R. Thompson, 1995. The Partial Least Squares (PLS) approach to causal modeling: Personal computer adoption and use as an illustration. Technol. Stud., 2: 285-309.

Barney, J.B., 1991. Firm resources and sustained competitive advantage. J. Manage., 17: 99-120.

Boone, M.E., 1991. Leadership and the Computer: Top Executives Reveal How they Personally Use Computers to Communicate, Coach, Convince and Compete. Prima Communications, Rocklin, California,.

Bresnen, M., L. Edelman, S. Newell, H. Scarbrough and J. Swan, 2003. Social practices and the management of knowledge in project environments. Int. J. Project Manage., 21: 157-166.

Candler, J.W., P.C. Palvia, J.D. Thompson and S.M. Zeltmann, 1996. The ORION project: Staged business process reengineering at FedEx. Commun. ACM., 39: 99-107.

Cooper, B.L., H.J. Watson, B.H. Wixom and D.L. Goodhue, 2000. Data warehousing supports corporate strategy at first American corporation. MIS Quart., 24: 547-567.

Cortada, J.W., 1995. TQM for Information Systems Management: Quality Practices for Continuous Improvement. McGraw-Hill, New York, USA.,.

Counsell, J., 1997. Using technology to involve the workforce. Total Q. Manage., 8: 126-129.

Davenport, T.H., 1993. Process Innovation: Reengineering Work through Information Technology. Harvard Business School Press, Boston.

Dean, J.W. and D.E. Bowen, 1994. Management theory and total quality: Improving research and practice through theory development. Acad. Manage. Rev., 19: 392-418.

Fornell, C. and D.F. Larcker, 1981. Evaluating structural equation models with unobservable variables and measurement error. J. Market. Res., 18: 39-50.

Gupta, A.K. and V. Govindarajan, 2000. Knowledge flows within multinational corporations. Strat. Manage. J., 21: 473-496.

Hair, J.F., 2009. Multivariate Data Analysis. 7th Edn., Prentice Hall, Upper Saddle River, New Jersey, USA.,.

Hitchner, E., 1993. Reengineering the Corporation: A Manifesto for Business Revolution. Harper Collins, New York, USA.,.

Kaplan, C., 1996. Technology to ease team-based quality assessments. National Prod. Rev., 15: 65-82.

Karlsen, J.T. and P. Gottschalk, 2004. Factors affecting knowledge transfer in IT projects. Eng. Manage. J., 16: 3-11.

Khanam, S., J. Siddiqui and F. Talib, 2016. Role of information technology in total quality management: A literature review. Int. J. Adv. Res. Comput. Eng. Technol., 2: 2433-2445.

Kock, J.N.F. and R.J. McQueen, 1997. Using groupware in quality management programs. Inf. Syst. Manage., 14: 56-62.

Kohli, R. and E. Hoadley, 2006. Towards developing a framework for measuring organizational impact of IT-enabled BPR: Case studies of three firms. ACM. SIGMIS. Database, 37: 40-58.

Lakhal, L., F. Pasin and M. Limam, 2006. Quality management practices and their impact on performance. Int. J. Qual. Reliab. Manage., 23: 625-646.

Leseure, M.J., J. Bauer, K. Birdi, A. Neely and D. Denyer, 2004. Adoption of promising practices: A systematic review of the evidence. Int. J. Manage. Rev., 5: 169-190.

Lindner, F. and A. Wald, 2011. Success factors of knowledge management in temporary organizations. Int. J. Project Manage., 29: 877-888.

Melville, N., V. Gurbaxani and K. Kraemer, 2007. The productivity impact of information technology across competitive regimes: The role of industry concentration and dynamism. Decision Support Syst., 43: 229-242.

Morrison, C.J., 1997. Assessing the productivity of information technology equipment in US manufacturing industries. Rev. Econ. Stat., 79: 471-481.

Pearson, J.M., C.S. McCahon and R.T. Hightower, 1995. Total quality management. Are information systems managers ready?. Inf. Manage., 29: 251-263.

Ramirez , R., N. Melville and E. Lawler, 2010. Information technology infrastructure, organizational process redesign and business value: An empirical analysis. Decision Support Syst., 49: 417-429.

Reeves, C.A. and D.A. Bednar, 1994. Defining quality: Alternatives and implications. Acad. Manage. Rev., 19: 419-445.

Sapsed, J., D. Gann, N. Marshall and A. Salter, 2005. From here to eternity? The practice of knowledge transfer in dispersed and co-located project organizations. Eur. Plann. Stud., 13: 831-851.

Siam, A.Z., K. Alkhateeb and A.S. Waqqad, 2012. The role of information systems in implementing total quality management. Am. J. Appl. Sci., 9: 666-672.

Sobkowiak, R.T. and R.E. LeBleu, 1996. Repositioning HR information systems: Empowering employees through information. Inf. Syst. Manage., 13: 62-64.

Stebbins, M.W., A.B. Shani, W. Moon and D. Bowles, 1998. Business process reengineering at Blue Shield of California: The integration of multiple change initiatives. J. Organiz. Change Manage., 11: 216-232.

Stoddard, D.B., S.L. Jarvenpaa and M. Littlejohn, 1996. The reality of business reengineering: Pacific bells centrex provisioning process. California Manage. Rev., 38: 57-76.

Zadrozny, M.A. and K.E. Ferrazzi, 1992. Building a technology base for TQM. Chief Inf. Officer J., 5: 16-21.