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Combined Impactof Knowledge Management and Total Quality Management on Innovation Performance: Insights from Indian IT Industry

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Abstract: ***Organizations are operating in an environment characterized by volatility, uncertainty, complexity and ambiguity. In such an environment an organization can attain sustained competitive advantage only through innovation. Innovation performance is the only effective yardstick that differentiates an ordinary organization from a world class one. Knowledge management is the process of creation and application of knowledge required for the attainment of organizational objectives. Total quality management stresses on continuous improvement to achieve organizational effectiveness. Despite the popularity of knowledge management, total quality management and innovation performance, empirical studies about the relationship between these variables is scant especially in Indian context. Present study attempted to find out the collective impact of knowledge management and total quality management on innovation performance in Indian IT industry. Data were collected from 219 employees working in 15 large IT organizations in Kerala by using simple random sampling technique. Results established that knowledge management and total quality management individually as well as collectively impact innovation performance. The significant influence on innovation performance is more when knowledge management and total quality management were combined. Results sensitize managers to create a differentiated management architecture that supports both knowledge management and total quality management simultaneously to foster innovation.***

Key words: Knowledge Management, Total Quality Management, Innovation Performance, Organizational effectiveness, Information Technology

I. INTRODUCTION

Today's business environment is characterized by turbulence, hyper competition and unparalleled changes and only through innovation an organization can create and maintain competitive advantage. According to Augusto, Lisboa andYasin (2014) [1], many scholarly works considers innovation as an important source of sustainable competitive advantage.The growing importance of knowledge management in organizations is attributed to the increased awareness about the role played by knowledge in an organization's growth and survival (Wang & Lin, 2013) [2]. Effective management of knowledge is a prerequisite for innovation to happen in an organization.

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This results in improved business performance through the creation of unique competencies. Wang and Lin (2013) [2]also opined that knowledge management alone is not sufficient to cater to the diverse needs of customers in a volatile business environment. There is a need to look at other factors which also influences the innovation performance of an organization. Total quality management with its focus on continuous improvement and customer focus ensures enhancement of quality performance in a wide variety of activities. Mixed results were presented in the literature about the relationship between total quality management and innovation performance (Byukusenge&Munene, 2017) [3]. Indian IT industry is undergoing lot of changes with the advent of artificial intelligence, data mining and cloud computing. Problems of high attrition, demanding customers,up-skilling, lack of employability skills and dwindling profits aggravated the challenges of IT organizations and for them innovation is the need of the hour. Extensive literature review highlighted two major gaps in the subject area of this research. First there is no empirical study in Indian context which explores the combined effects of knowledge management and total quality management on innovation performance. Second is the inconsistency in the empirical results of studies that investigated the relationship between total quality management and innovation. To address these gaps, present study was conducted and it examines the individual and joint impact of knowledge management and total quality management on innovation performance in Indian IT organizations.

II. LITERATURE REVIEW

A. Knowledge Management (KM) as a concept

KM shall be viewed as an umbrella term for a range of diverse and interdependent activities namely knowledge creation,knowledge valuation and metrics, knowledge mapping and indexing, knowledge transport, storage and distribution and knowledge sharing (Coleman, 1999) [4]. Skyrme (2001) [5] defined Knowledge Management as "the explicit and systematic management of vital knowledge, and its associated processes of creation, organizing, diffusion, and exploitation." Researchers conceptualized KM in different ways by highlighting the multi-dimensional nature of KM. According to Darroch (2003) [6], KM encompasses attainment, dissemination and utility of available knowledge.

Bhatti and Qureshi (2007) [7] observed KM as the process of identification and use of explicit and tacit knowledge of individuals, groups and organizations for building organizational assets.

Kiessling, Richey, Meng, &Dabic (2009) [8] defined KM as the process of acquiring, storing, understanding, sharing, implementing knowledge in the organization. They also highlighted the role of learning process in alignment with the strategies of the organization.

B. Total Quality Management (TQM) as a concept

History of TQM can be traced back to the period after the Second World War and the concept originated in Japan. Gradually there was a stupendous increase in the popularity of TQM as prominent countries like US began to implement it in their manufacturing organizations during 1980s. Steingrad and Fitzgibbons (1993) [9] define TQM as "a set of procedures and techniques used to reduce or eliminate variations of the production processes, or services, in order to improve the efficiency, reliability and quality". TQM is a philosophy which aims at continuous improvement in the organization by integrating various management techniques, technical tools and development methods (Basterfield, 2003) [10]. According to Obeidat, Al-Suradi, Masa'deh andTarhini (2016) [11], TQM stresses on integration of important organizational processes to identify customer needs in a better manner for pursuing organizational objectives. It's a journey towards excellence through continuous improvement in which both management and employees are involved. Álvarez-García, del Río-Rama andMiras-Rodríguez (2017) [12] commented that organizations implement TQM because it influences the service quality and results. TQM can ensure sustained competitive advantage to an organization when it is successfully implemented.

C. Innovation Performance (IP) as a concept

Innovation is the implementation of creative ideas leading to organizational effectiveness. Crossan and Apaydin (2010) [13] suggested that innovation may happen in any activity in the organization which may include renewal and expansion of product, services and market, new way of product development and design of new management system resulting in novelty in business. For Kuhn and Marisck (2010) [14], innovation is the process of converting an amazing idea into a business reality that create value by surpassing the expectations of customers. The different conceptualizations of innovation highlight value creation in an organization and the activity can be anything from newly developed products to patents or creative use of information. Different parameters are used to measure organizational innovation performance namely product, process and market innovation as suggested by McGrath (2001) [15]. Mazzarol and Reboud (2008) [16] used administrative innovation instead of market innovation to measure organizational innovation. An organization's IP is determined by the adaptability of the organization to the changing market, technology and environment.

D. Relationship between KM and IP

There is no dearth of studies linking KM and IP especially in developed countries like US, Australia and Singapore. Xu, Houssin, Caillaud, and Gardoni (2010) [17] in their study found that the manner in which knowledge is managed in the organization decides successful innovations. Leal-Rodríguez, Leal-Millán, Roldán-Salgueiroand Ortega-Gutiérrez (2013) [18] also established that KM at different levels in the organization ensure unique competencies which ultimately culminate in better organizational performance through innovation. This was supported by Nawaz, Hassan and Shaukat (2014) [19] who stated that one of the major contributors of increased sales is KM as it facilitated in new product development and innovation. Evidence about the relationship between KM and IP in SME, banking, telecommunication and information technology sectors is found in the literature. For example the study by Alegre, Sengupta, and Lapiedra (2011) [20] established a significant impact of KM on innovation in high technology SME industry. SimilarlyNawab, Nazir, Zahid and Fawad (2015) [21] revealed relationship between KM and IP when they conducted their study in the banking sector. Alrubaiee, Alzubi, Hanandeh and Ali (2015) [22] also established the impact of KM on innovation in telecommunication and information technology. Research about KM practices in Indian organizations is documented in the literature, but empirical evidence linking KM and IP is scant in Indian context especially in IT industry. There is a gap in this area so an attempt was made to study the impact of KM on IP in Indian IT sector. Hence this study proposes that

H1: Knowledge management positively impacts innovation performance in Indian IT industry

E. Relationship between TQM and IP

Empirical evidence about the relationship between TQM and IP is found in the extant literature. Sadikoglu andZehir (2010) [23] through their study established a significant positive relationship between TQM and product innovation. Martínez-Costa andMartínez-Lorente (2008) [24]conducted research among Spanish companies and found empirical evidence for the impact of TQM on organizational innovation. Contradictory findings were also reported in the literature highlighting no significant relationship between the two variables. For instance, Singh and Smith (2004) [25] failed to get enough statistical evidence to prove TQM's capability to enable the organization to become innovative. Hoang, Igel and Laosirihongthong (2010) [26] in their study did not out rightly reject the impact of TQM on IP, but stated that TQM's influence on IP is only limited and there are more disadvantages than advantages. These inconsistencies and contradictory findings call for more research in this area and the second hypothesis of the study was set as

H2: TQM positively impacts Innovation performance in Indian IT industry

F. Combined impact of KM and TQM on IP

Hung, Lien, Yang, Wu andKuo (2011) [27] argued that among the antecedents of innovation, KM and TQM occupied a pivotal position in majority of the scholarly works. A number of empirical studies proved the impact of KM on IP and TQM on IP individually. Only a limited number of studies are available in the literature about the relationship between KM, TQM and IP.

According to Molina, Llorens-Montes and Ruiz-Moreno (2006) [28] knowledge transfer mediated the impact of TQM on performance. When Hung, Lien, Fang, and McLean (2010) [29]
conducted their study, they observed that TQM act as a mediator in the relationship between KM and IP. These inconsistencies and lack of real empirical evidence about the combined effect of KM and TQM on IP is the main motivation behind the present study. Research which comprehensively and simultaneously investigates the relationship between the three variablesis almost nil in Indian context especially in information technology industry. In this context the present study attempted to find out the combined effect of KM and TQM on IP in Indian IT Industry. Thus H3 is as follows

H3: KM and TQM jointly impact Innovation performance in Indian IT industry

III. METHODOLOGY

A. Participants

219 employees working in various IT organizations in Kerala were selected as the sample for the present study. Among these respondents, 123 were male and 96 were female employees. 132 employees were married and the remaining 87 were unmarried. 37.9 percent of respondents belong to the age group of 21-30, 32.4 percent belongs to 31-40 and remaining 29.7 percent were above 40 years. With regard to work experience, 37.4 percent have 0-10 years of experience, 34.7 percent have 11-20 years and 27.9 percent have more than 20 years of work experience. With respect to cadre of employees, 136 were from the non-managerial and 83 were from the managerial level.

B. Procedure

A two stage sampling technique was adopted for the collection of data. 15 IT organizations in Kerala which implemented total quality management &knowledge management initiatives and having more than 500 employees were randomly selected in the first stage. In the subsequent stage, 15 employees from each of these organizations were selected using simple random sampling method for administering the questionnaire. Among the 225 questionnaires given for collection of data, six were discarded for lack of complete information. Thus the final sample consisted of 219 full time employees from 15 IT organizations in Kerala. The study was conducted during Dec 2018- June 2019.

C. Measuring Instruments

Three structured questionnaires were administered for the present study using previously validated and established scales. The sections of the questionnaire are detailed below.
Knowledge Management: The independent variable KM was assessed by measuring knowledge acquisition and creation [scales developed by Gold, Malhotra andSegars(2001) [30] and Lawson (2003) [31]], knowledge capturing and storage [adopted from Al-Busaidi and Olfman (2005) [32] and Lawson (2003) [31]], knowledge dissemination and transfer [adopted from Lawson (2003) [31]] and knowledge application adopted from Lin and Lee (2005) [33]. The instrument has 28 items under these four dimensions. The sample items in the instrument include: "My organization is effective in absorbing knowledge from individuals into the organization", "My organization is having processes for applying experiential knowledge". A seven-point Likert-type scale ranging from strongly disagree (1) to strongly agree (7) was used to indicate the level of agreement.
Total Quality Management: The predictor variable TQM was assessed by measuring the five dimensions: top management support, employee involvement, data base decisions, continuous improvement and customer focus. Scale developed by Antony, Leung, Knowles, and Gosh (2002) [34] was used to measure employee involvement and continuous improvement. For assessing top management support, scale developed by Singh and Smith (2004) [25], for database decisions- scale developed by Powell (1995) [35] and customer focus-scale developed byZeitz, Johannesson and Ritchie (1997) [36] were used. Sample items in the questionnaire include: "Managers' and employees' periodically review quality issues in meetings, "Employees' in work unit know who their customers are". The questionnaire included 17 statements with response options ranging from 1=strongly disagree to 7=strongly agree.
Innovation Performance: Dependent variable IP was assessed by measuring the product and process innovation using the scales developed by Singh and Smith (2004) [25] and Prajogo and Sohal (2003) [37]. Level of innovativeness, number and speed of innovation were the criteria used for assessing IP. The sample statements in the questionnaire include: "Organization is effective in using the latest technological innovations in new product development", "Organization is effective in enhancing the speed of new product development". Respondents indicated their response on a seven point scale with anchors (1) strongly disagree to (7) strongly agree.

D. Reliability of the instrument

Reliability of the instrument was tested by conducting a pilot study among 50 respondents. Cronbach's alpha value of the three questionnaires were found to be greater than 0.7 (KM: 0.787; TQM:0.897; IP: 0.811). Thus reliability of the instrument was found to be good to conduct the study.

IV. RESULTS AND DISCUSSION

The frequency distribution (mean and standard deviation) of three variables are presented in Table 1

Table I: Mean and Standard deviation of the variables

	Knowledge Management	Total Quality Management	Innovation Performance
Mean	4.174	4.153	4.159
Standard deviation	0.3091	0.1613	0.2776

Source: Author's analysis

A. *Impact of KM on IP*

In order to test the hypothesis for the influence of KM on IP, correlation and simple linear regression were conducted. The results are presented in Table II and III.

Table II: Correlation between KM and IP

	KM	IP
KM	1	0.692(**)
IP	0.692(**)	1

**. Correlation is significant at the 0.01 level. Source: Author's analysis

Table II revealed a significant positive relationship between KM and IP at 0.01 level (0.692) providing support for the first hypothesis. This result is in agreement with earlier studies conducted by Amalia andNugroho (2011) [38] and Nawab et al. (2015) [21]. The high positive correlation between the two variables highlight that if KM is practiced in the organization, it enhances innovation in the organization.

Table III shows the impact of KM on IP.

Table III: Linear Regression analysis between KM and IP

Model	Unstandardized coefficients B	Standard error	Beta	t-value	Sig	R^2 value	F value	D f
Constant	1.564	0.184		8.491	.000	0.479	199.529	1
KM	0.622	0.044	0.692	14.125	.000			

Dependent variable: Innovation performance, Source: Author's analysis

From Table III, a significant regression equation was found (F (1,217) = 199.529, p<0.001), with an R^2 of .479. That is 47.9 percent of IP can be predicted by KM. KM was found to be statistically significant in predicting IP (β = 0.692, sig<0.05). As a result of regression analysis, it is possible to predict the IP by the equation as follows:

Innovation performance= 1.564+0.622 (Knowledge Management)

Thus forone unit increase of KM, IP increases by 0.622. These results also provide full support for H1. This is in concordance with some of the earlier studies reported in the literature. Mardani, Nikoosokhan, Moradi andDoustar (2018) [39] also reported through their study that 28 percent variance in innovation is predicted by KM. In the same vein, Honarpour, Jusoh andMdNor (2017) [40] andByukusenge andMunene (2017) [3] also observed the predictive power of KM on IP. Results of the present study reiterate the role of KM initiatives in promoting organizational innovation.

B. *Impact of TQM on IP*

For testing hypothesis 2, correlation and simple linear regression were used. The results are shown in Table IV and V.

Table IV: Correlation between TQM and IP

	TQM	IP
TQM	1	0.716 (**)
IP	0.716 (**)	1

**. Correlation is significant at the 0.01 level. Source: Author's analysis

Table IV shows a significant positive correlation between TQM and IP (0.716) at 0.01 level. This was in line with the previous studies of Honarpour, Jusoh and MdNor (2017) [40] andAbrunhosa and Sap (2008) [41]. Present result provides evidence for H2.

Table V: Linear Regression analysis between TQM and IP

Model	Unstandardized coefficients B	Standard error	Beta	t-value	Sig	R^2 value	F value	D f
Constant	-0.959	0.339		-2.828	.005	.513	228.130	1
TQM	1.232	.082	0.716	15.104	.000			

Dependent variable: Innovation performance, Source: Author's analysis

From Table V, a significant regression equation was found (F (1,217) = 228.130, p<0.001), with an R^2 of .513. This shows that 51.3 percent of IP can be predicted by TQM. TQM was found to be statistically significant in predicting IP (β = 0.716, sig<0.05). As a result of regression analysis, it is possible to predict the IP by the equation as follows:

Innovation performance= -.959+1.232 (TQM)

Thus for one unit increase of TQM, IP increases by 1.232. Thisalso provide full support for H2. This is in agreement with the research works of Antunes, Quiros and Justino (2017) [42]; Schniederjans andSchniederjans (2015) [43] and Sadikoglu andZehir (2010) [23]. Present result rejects the earlier studies which argued about the negative relationship between TQM and IP. TQM implemented successfully in the organization definitely facilitates organizational innovation.

C. *Combined impact of KM and TQM on IP*

Multiple linear regression was conducted to test the combined effect of KM and TQM on IP. Preliminary analyses were conducted to ensure that there was no violation of the assumption of normality, linearity and multicollinearity. Table VI presents the results of multiple regression.

Table VI: Multiple Regression analysis between KM, TQM and IP

Model	Unstandardized coefficients B	Standard error	Beta	t-value	Sig	R^2 value	F value	D f
Constant	-0.639	0.309		-2.069	.040	0.606	166.272	2
KM	0.357	0.050	0.397	7.170	.000			
TQM	0.797	0.095	0.463	8.353	.000			

Dependent variable: Innovation performance, Source: Author's analysis

From Table VI, a significant regression equation was found ($F(2,216) = 166.272$, $p<0.001$), with an R^2 of .606. Thus 60.6 percent of IP can be predicted by KM and TQM.

The independent variables KM ($\beta = 0.397$, sig<0.05) and TQM ($\beta = 0.463$, sig<0.05) were found to be statistically significant in predicting IP.

From the results of multiple regression analysis, it is possible to predict the IP by the equation as follows:

IP= -0.639+0.357 (KM) +0.797 (TQM)

Thus for one unit increase of TQM, IP increases by 0.797 and for each one unit increase of KM, IP increases by 0.357. These results a provide support for H3.

It can be seen from the results that the combined effect of KM and TQM accounts for 60.6 percent of variance in IP. This is significantly higher than the variance predicted when KM and TQM were taken separately. Simple linear regression between KM and IP revealed a variance of 47.9 percent and 51.3 percent was the variance observed when TQM was regressed with IP.

Present finding also showed that the effect of TQM on IP is more than the effect of KM on IP. Since the combined effect of KM and TQM on IP is highly significant as established in the study, organizations should have both these practices to foster innovation. For the first time such an empirical study was conducted in Indian IT industry and the results were statistically significant in establishing the combined effect.

V. MANAGERIAL IMPLICATIONS

This is the first empirical study which examined the combined effects of KM and TQM on IP in large IT organizations in India. Large IT organizations started realising the contributions of KM and TQM towards innovation. Present study provided empirical evidence for the combined effect of KM and TQM on IP. The two predictors individually as well as jointly impacted IP in the organization. Managers at all levels shall take the necessary initiatives to implement KM and TQM initiatives in their organization. Employees shall be encouraged to acquire, store, retrieve and apply knowledge as this will boost organizational learning. Lifelong learning shall be emphasized by the managers to convert their organizations into a knowledge enterprise. Principles of TQM shall be adhered to for ensuring customer focus and continuous improvement. Organizations can create a differential management architecture for the successful implementation of both KM and TQM. India requires more organizations which can bring in innovation to improve its present fifty second position in the Twelfth Global Innovation Index, 2019. Organizational innovation through implementation of practices like KM and TQM may culminate in better business performance. Thus India's dream of becoming third largest consumer market in the world as well as a five trillion US dollars economy by 2025 shall become a reality.

VI. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

The results of this study should be considered in light of its limitations. The study didn't take into consideration the extraneous variables associated with different organizations. Thus generalizing the results to other organizations may be done with caution. Another limitation of the study is with the cross sectional design used which may affect the generalizability of results as it is limited to a particular time of measurement. Since empirical research about KM, TQM and IP is scant in Indian context, future research can be conducted with a large sample in other industries using longitudinal design. Researchers can assess organizational performance along with KM, TQM and IP in their future research and can examine the mediating or moderating role of KM or TQM towards organizational performance.

VII. CONCLUSION

There is an exponential growth in the popularity of KM, TQM and IP, but the empirical research about the relationship between these variables is still in the nascent stage. Present study tried to address this lacunae. Results established the individual as well as combined effect of KM and TQM on IP. The study also found that TQM positively impacted IP, thus discarding the earlier studies which found an inverse relationship between the two. Results of the study adds value to the existing body of knowledge about these variables as enough quantitative studies especially in Indian context is not recorded. Findings of the study can be a new revelation to managers to consider the importance of KM and TQM as implementation of these two initiatives can foster innovation in the organization. Innovation which is a panacea for organizational inefficiency and lacklustre performance results from constituting a management architecture which simultaneously supports KM and TQM.

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