

THE EFFECTS OF KNOWLEDGE MANAGEMENT INFRASTRUCTURE CAPABILITY ON KNOWLEDGE MANAGEMENT EFFECTIVENESS OF DOCTORS: AN EMPIRICAL STUDY

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ABSTRACT

Today, Knowledge Management (KM) plays a pivotal role in the organizations especially in Information Technology and Manufacturing Sectors, for achieving sustainable competitive advantage. Hospitals are highly knowledge intensive area since it comprises of highly qualified knowledge workers and it gain tremendous knowledge in each specialty. However, the healthcare knowledge is largely underutilized due to lack of availability of specific knowledge at the point of care. Knowledge is of little or no value if it is not available when needed. In order to implement the KM practices effectively, hospitals need to assimilate KM capabilities namely KM infrastructure capability and KM process capability. The purpose of this paper is to identify the various elements of KM infrastructure capability prevailing in the hospitals. It also attempts to explore the effects of KM infrastructure capability on KM effectiveness of doctors. The study is carried out in 4 private multi-specialty hospitals with over 500 beds, in 2 Indian Metro Cities i.e., Chennai and Bangalore. The primary data is collected from 60 doctors practicing in various clinical specialties, through face-to-face questionnaire survey. Multiple regression analysis was adopted. The findings show that organizational culture and organizational structure have significant effect on KM effectiveness of doctors. This paper provides hospital managers with insights into how to develop and sustain KM infrastructure capability for stimulating KM process capability as well as enhancing KM effectiveness of doctors. The results of the study will hopefully contribute for future work in the area since this paper addresses an important and not researched issue on the KM-enabled doctors' performance.

Keywords: Knowledge Management, Knowledge Management Infrastructure Capability, Knowledge Management Effectiveness

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1. INTRODUCTION

Knowledge has become the key economic resource and the dominant source of sustainable competitive advantage in any organization as predicted by Peter F. Drucker in 1995. The “Resource-Based View” of the firm contends that sustainable competitive advantage can only be achieved with the strategic resources that are valuable, rare, inimitable and non-substitutable in the organization (Barney, 1992). Subsequently, the “Knowledge-Based View” of the firm considered ‘Knowledge’ as the strategic resource in the organization (Grant, 1996). Knowledge is a justified personal belief that increases an individual’s capacity to take effective action (Nonaka, 1994) and resides in individuals as well as collectively in the organization. Knowledge-based view focused on how knowledge resources are utilized and coordinated in organizations.

Duhon (1998) defined Knowledge Management (KM) is a discipline that promotes an integrated approach for identifying, capturing, evaluating, retrieving and sharing all of an organization’s information assets. These assets may include database, documents, policies, procedures and previously uncaptured expertise and experience in individual workers. McInerney (2002) elaborated that KM is an effort to increase useful knowledge within the organization. Ways to do this include encouraging communication, offering opportunities to learn and promoting the sharing of appropriate knowledge objects or artifacts.

Gold et al. (2001) examined the issues of effective KM from the perspective of organizational capabilities. They found that KM infrastructure capabilities (technology, structure and culture) and KM process capabilities (acquisition, conversion, application and protection of knowledge) are the drivers of organizational effectiveness.

In the above theoretical background, Organizations need to balance two aspects of knowledge (i) the content of knowledge available in the forms of tacit or personal knowledge and explicit or codified knowledge; and (ii) the capability to leverage existing knowledge and create new knowledge (KM infrastructure and process). New knowledge is created through social interaction between tacit and explicit knowledge. These will improve KM effectiveness in terms of learning, innovation, decision making, collaboration in the organization and thereby better organizational performance.

Today, Organizations especially from Information Technology and Manufacturing sectors, are focusing on effective implementation of KM practices. Hospitals are facing increasing pressure for lower cost and higher quality of healthcare services. Managing knowledge in hospitals is crucial for optimal achievement of lowered cost of services with higher quality. However, awareness of KM in hospitals are in the infancy stage. This study focuses on KM infrastructure capability prevailing in hospitals and its effect on KM effectiveness of doctors. Accordingly, the following objectives are formulated:

1.1. Objectives of the Study

1. To identify various elements of KM infrastructure capability prevailing in the hospitals.
2. To explore the effects of KM infrastructure capability elements on KM effectiveness of doctors.
3. To suggest the measures for sustaining KM infrastructure capability in the hospitals.

1.2. Conceptual Framework and Hypotheses development

This Research paper is based on both primary and secondary data. A range of relevant KM literature is explored. The following research model is proposed to explore the effects of KM infrastructure capability elements on KM effectiveness of doctors.

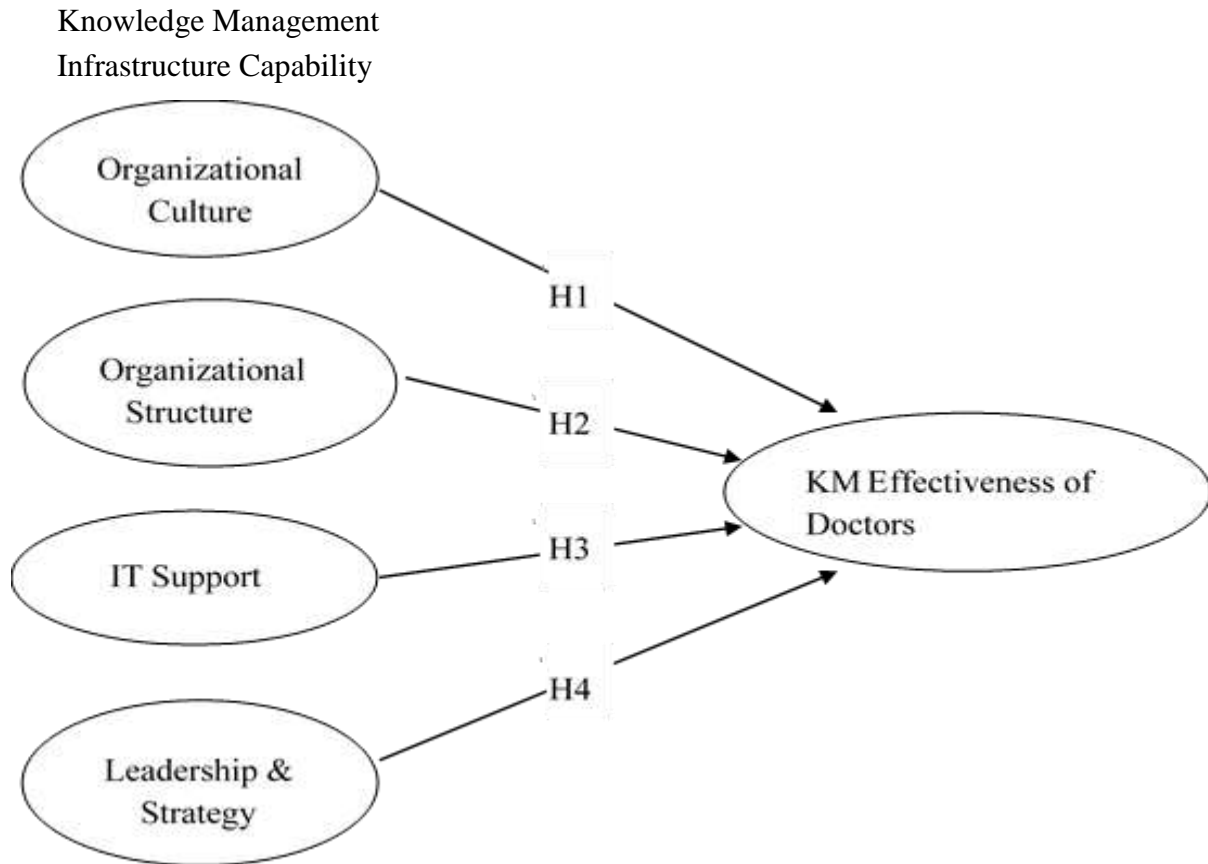


Figure 1 Conceptual Framework

The following four hypotheses are formulated for testing the above research model:

H1. There is a significant effect of organizational culture on KM effectiveness of doctors.

H2. There is a significant effect of organizational structure on KM effectiveness of doctors.

H3. There is a significant effect of IT support on KM effectiveness of doctors.

H4. There is a significant effect of leadership and strategy on KM effectiveness of doctors.

2. LITERATURE REVIEW

2.1. Knowledge Management Infrastructure Capability

Gold et al. (2001) argued that KM infrastructure capability (culture, structure and technology) is the mechanism for the organization to stimulate KM Process capability (acquisition, conversion, application and protection of knowledge). KM infrastructure enables maximization of social capital that aims at emphasizing the importance of social contacts between groups and within groups. Therefore, organizations initially need to focus more on developing KM infrastructure capability.

2.1.1. Organizational Culture

Organization culture is the sum of beliefs, expectations, norms and values shared by most employees in an organization (Cerovic et al., 2011). The biggest challenge is changing a prevailing organizational culture from ‘knowledge is power’ to ‘knowledge sharing is power’. Such culture can be changed over time, in variety of ways (Skyrme, 2002). If the organization focuses more on learning, the employees will be expected to create more knowledge (Simon, 1991). So, organizations are required to put more emphasis on both team and individual learning to enhance organizational performance (Huysman & DeWit, 2003). Lynn et al. (1999) found a positive relationship between learning and innovation. Innovation is defined as the creation of new knowledge and ideas to facilitate new business outcomes aimed at improving internal business processes and structures and to create market driven products and services (Plessis, 2007). Collaborative culture stimulates knowledge sharing among individuals, groups & organizations and it stimulates knowledge acquisition (Swee C. Goh, 2002). According to Brinck (2003), knowledge sharing may be enabled by collaboration in the way people develop their relationship with each other. If people do not trust each other, they do not exchange knowledge and ideas (Verna Allee, 2003). Nelson and Coopriider (1996) empirically tested trust as an antecedent to knowledge sharing and described a casual relationship.

2.1.2. Organizational Structure

Organizational structure involves formalization, centralization of authority, complexity, and integration (Miller and Droge 1986). Formalization refers to the degree to which rules, standard policies and procedures govern decisions and working relationships (Fredrickson, 1986). Lee & Choi (2003) argued that the range of new ideas seems to suffer a restriction when strict formal rules dominate an organization. However, Brett, Jeanne et al. (2006) contends that formalization as a source for the creation and use of knowledge. Decentralization of decision-making is a consequence of the distribution of authority among the different structural components (Fredrickson, 1986). A decentralized organizational structure clearly seems to favour an environment where employees participate in knowledge building processes more spontaneously (Lee & Cho, 2003). According to Robbins (1990) & Fredrickson (1986), complexity refers to the degree of differentiation that exists within an organization. The three dimensions that usually indicate the level of structural complexity are horizontal, vertical and spatial differentiation. Horizontal dimension of complexity can be a better predictor of knowledge creation than the vertical and spatial dimensions (Damanpour and Schneider, 2006). It is important that organizational structures are designed for flexibility (as opposed to rigidity) so that they encourage sharing and collaboration across boundaries within the organization (Gold, et al. 2001). Generally, in any organization unless the organizational structure becomes more informal and decentralized achieving KM will become virtually impossible.

2.1.3. IT Support

An organization’s use of technology to manage knowledge has quickly emerged as the most important discriminator between success and failure in the intensely competitive global economy (Marquardt, 2002). Advances in Information and Communication Technology have led to the design of innovative knowledge-sharing environment and programs, whereby geographically individuals are virtually accessible to meet, collaborate, create and share knowledge (Majchrzak et al. 2000). Zaim et al. (2007) found that information technology improves KM performance.

2.1.4. Leadership and Strategy

Facilitative leadership with KM vision and strategy is essential for KM success. Strong top management support is a sine quo non for all changes in the organization (Kotter, 1996) and holds the same with knowledge sharing. Nonaka (2007) argue that the success of a company in the twenty-first century will be determined by the extent to which its leaders can develop intellectual capital through knowledge creation and knowledge sharing. Another aspect is the knowledge vision through which the kind of future that the organization imagines for itself and determines the collective ideal mission and domain. It gives the organization's direction and focus concerning the knowledge to be created beyond its existing products, capabilities, organizational structure and markets (Nonaka, 2008). Hansen et al., (1999) elaborated two KM strategies (i) personalization strategy relies extensively on the identification of experts and the areas of their expertise; (ii) codification strategy relies extensively on the ability of the organization to codify – capture, store and reuse – the available knowledge.

2.2. KM Effectiveness

KM effectiveness acts as a mediator between KM capability and organizational performance. Anantatmula (2007) defines KM effectiveness in terms of useful KM outcomes such as improved communication, enhanced collaboration, improved employee skills, better decision-making and improving productivity. His research has also shown that the attributes of KM effectiveness can lead to improvements in organization performance such as customer satisfaction through better product or service quality. This is possible due to a learning environment, employee development, effective communication tools and knowledge sharing.

2.2.1. Dimensions of KM Effectiveness in Hospitals

In hospitals, KM intends to enlarge knowledge horizon of doctors who will be able to integrate individual clinical expertise with the best available external clinical evidence from systematic research (Sackett et al. 1996). KM within a context of evidence-based healthcare gives the potential to improve quality of service (Rajeev K Bali, 2007). Further, KM is able to assist in medical errors reduction and consequently their cost, by providing a decision support for practitioners (Abidi, 2001). In a complex field such as healthcare, cooperation between the different health care providers is vital in order to deliver quality of care (Elliott & O'Dell, 1999). Studies have shown that lack of cooperation in health care is a leading cause of many medical errors, hence there is a need for coordinated inter-professional care strategy (Inter-professional care steering committee – HealthForceOntario, 2007). Thus, cooperative diagnosis can be achieved by the healthcare actors via the implementation of KM systems (Dieng-Kuntz, et al., 2006).

2.3. Relationship among KM Infrastructure Capability, KM Effectiveness and Organization Performance

2.3.1. Relationship among various KM Infrastructure Capability elements

Satyendra C Pandey and Andrew Dutta (2013) found that organizational structure plays a facilitating and steering role in developing the culture of knowledge. Milad Farzin Mohammad Gholami Azizi (2014) found that there is a significant and positive direct relationship between organizational culture and KM strategy.

2.3.2. Relationship between KM Infrastructure Capability elements and KM Effectiveness

Khalifa (2001) identified that KM strategy, technology fit, leadership and culture significantly affect the adequacy of KM structures and subsequently KM effectiveness. Strategy had the

strongest effect and Culture had the weakest effect. Gholamreza Enayati et al. (2012) found different organizational factors such as IT, organizational structure, and organizational culture play important role in KM effectiveness.

2.3.3. Relationship between KM Infrastructure Capability elements and Organizational Performance through the mediation effect of KM Effectiveness

Mirela Kljajic-Dervic and Roberto Biloslavo (2015) found that leadership, human capital and organizational culture have a positive impact on KM effectiveness. Leadership was the most important factor affecting KM effectiveness and also a positive impact of KM effectiveness on business performance. Laith Ali Yousif AL-Hakim and Shahizan Hassan (2012) found that critical success factors of KM (HRM, information technology, leadership, organizational learning, organizational strategy, organizational structure and organizational culture) had a positive and statistically significant effect on organizational performance through the partial mediation effect of innovation.

3. RESEARCH METHODOLOGY

3.1. Sample and Data Collection

This study adopts descriptive as a research design and non-probability judgemental sampling as a sampling design. The unit of analysis in this study was doctors practicing in various clinical specialty from the private multi-specialty hospitals with over 500 beds capacity, in two Indian Metro Cities i.e., Chennai & Bangalore. A study is empirically based on the primary data collected from 60 doctors through face-to-face questionnaire survey.

3.2. Measures of Variables

The questionnaire consists of three parts:

1. Part-I: Demographic details of the respondent.
2. Part-II: KM infrastructure capability. It measures 4 constructs i.e., organizational culture, organizational structure, IT support, leadership & strategy and has 16 items.
3. Part-III: KM effectiveness of doctors. It has 6 items.

It uses a 5-point Likert Scale ranging from strongly disagree (1) to strongly agree (5) with neutral as 3. The details of constructs and the respective items are outlined in Table.2 below. The items are adapted from previous studies which were used and validated in other industries. These items are appropriately modified for the hospital settings. The data collected was entered in SPSS for statistical analysis.

3.2.1. Reliability Test

Cronbach alpha is a measure to determine the internal consistency and explains the extent to which a variable or set of variables is consistent in what it intends to measure (Hair et al., 2006). Alpha values over 0.7 are generally considered acceptable (George and Mallery, 2003). Table 2 shows that all constructs have alpha values higher than 0.7, ranging from 0.777 to 0.884.

3.2.2. Validity Test

Kaiser-Meyer-Olkin (KMO) was applied to ensure that the sample is adequate for factor analysis. The KMO value was 0.845 which was close enough to 1. KMO values between 0.8 and 0.9 are great (Kaiser, 1974). Therefore, the sample was adequate. Bartlett's Test of Sphericity was significant, with a p-value of 0.000, suggesting further appropriateness of

using factor analysis. Factor analysis was carried out for detecting the underlying structure of the variables – KM infrastructure capability and KM effectiveness of doctors.

Table 1 Kaiser-Meyer-Olkin (KMO) and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.845
Bartlett's Test of Sphericity	Approx. Chi-Square	118.577
	df	10
	Sig.	0.000

Exploratory factor analysis was used to extract factors and items that were loaded to each factor. A principal component analysis was used together with varimax & Kaiser Normalisation method, to extract items. The resulting items and factors are shown in Table 2 below. All factor loadings are higher than 0.4, ranging from 0.461 to 0.936.

The relatively higher values for reliability and validity imply that the instruments used in this study were adequate and the outcome of this analysis will be reliable and valid.

Table 2 Operationalization of KM Infrastructure Capability and KM Effectiveness of Doctors

Constructs	Factors	Items	Factor loading	Cron -bach α
Organizational Culture	Learning	My hospital enables me to update the clinical knowledge.	0.530	0.861
	Innovation	My hospital enables me to innovate in clinical practices.	0.829	
	Collaboration	My hospital enables me to collaborate with others across the specialty.	0.461	
	Trust	My hospital creates an environment for increasing the mutual trust among doctors.	0.594	
Organizational Structure	Formalization	My hospital has written rules and procedures in clinical practices.	0.649	0.777
	Decentralization	My hospital enables me to make own decisions in clinical practices.	0.609	
	Complexity	My hospital enables me to share the knowledge through the formal reporting pattern.	0.885	
	Integration	My hospital enables me to work with other doctors as a team.	0.730	
Information Technology support	Knowledge Acquisition	My hospital has IT support for acquiring outside knowledge.	0.841	0.884
	Knowledge Sharing	My hospital has IT support for increasing collaboration among doctors.	0.855	
	Knowledge Storage	My hospital has IT support for codifying and storing doctors' knowledge.	0.803	
	Knowledge Application	My hospital has IT support for making better decisions.	0.597	
Leadership and Strategy	Top Management Support	My hospital supports the knowledge management initiatives through the top management.	0.679	0.834
	Knowledge Vision	My hospital has knowledge vision for improving the quality of healthcare delivery.	0.817	

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	Personalization	My hospital enables me to share the knowledge through creating networks with other doctors.	0.631	
	Codification	My hospital enables me to share the knowledge through IT-driven knowledge management system.	0.649	
KM Effectiveness of doctors	Enhancement of Knowledge	KM enables me to increase the knowledge in clinical practices.	0.801	0.881
	Reduction of Medical Errors	KM enables me to reduce the medical errors in clinical practices.	0.902	
	Better Decision making	KM enables me to make better decisions at the point of care.	0.838	
	Collaborative Care	KM enables me to collaborate with others for improving 'patient-centered care'.	0.779	
	Implementation of Best Practices	KM enables me to adopt best clinical practices.	0.795	
	Cost Effective Care	KM enables me to avoid re-learning and reduce the cost of care.	0.936	

4. DATA ANALYSIS AND RESULTS

4.1. Demographic Data

The composition of the respondents is shown in Table 3 below:

Table 3. Demographic Characteristics of Respondents

Factors	Determinant	Frequency	Percentage
Gender	Male	39	65
	Female	21	35
	Total	60	100
Age Group	30 years & below	35	58.3
	31 to 40 years	13	21.7
	41 to 50 years	6	10
	51 to 60 years	3	5
	61 years & above	3	5
	Total	60	100
Education	Undergraduate (MBBS/BDS)	2	3.3
	Postgraduate (MD/MS/DNB/Dip)	51	85
	Super specialty (DM/Mch)	7	11.7
	Total	60	100
Total Experience in clinical practices	10 years & below	45	75
	11 to 20 years	9	15
	21 to 30 years	3	5
	31 years & above	3	5
	Total	60	100
Experience in present hospital	10 years & below	54	90
	11 to 20 years	5	8.3

	21 to 30 years	1	1.7
	31 years & above	-	-
	Total	60	100

Table 3 shows that out of 60 respondents, majority are male (65%) and possess postgraduate qualification (85%). 58% of the respondents are in the age group of 10 years & below. 75% of the respondents have total experience of 10 years & below and 90% of the respondents have experience of 10 years & below in the present hospital.

4.2. Descriptive Statistics

From Table 4, the highest mean score is 4.45 for formalization and the lowest mean score is 3.85 for knowledge application system. The small variation in mean score is 0.622 for formalization and the high variation in the mean score is 1.013 for knowledge sharing system.

Table 4 Mean and Standard Deviation for KM Infrastructure Capability elements and KM Effectiveness of Doctors

Constructs	Factors	Mean	Standard Deviation
Organizational Culture	Learning	4.30	0.671
	Innovation	4.17	0.693
	Collaboration	4.18	0.701
	Trust	4.07	0.710
Organizational Structure	Formalization	4.45	0.622
	Decentralization	3.98	0.948
	Complexity	4.23	0.767
	Integration	4.20	0.840
Information Technology Support	Knowledge Acquisition	4.02	0.965
	Knowledge Sharing	3.92	1.013
	Knowledge Storage	3.92	0.962
	Knowledge Application	3.85	0.899
Leadership and Strategy	Top Management Support	3.97	0.780
	Knowledge Vision	3.95	0.790
	Personalization	4.05	0.699
	Codification	4.10	0.775
KM Effectiveness of Doctors	Enhancement of Knowledge	4.35	0.659
	Reduction of Medical Errors	4.43	0.673
	Better Decision making	4.28	0.715
	Collaborative Care	4.17	0.763
	Implementation of Best Practices	4.37	0.637
	Cost Effective Care	4.10	0.877

4.3. Hypotheses Testing

Hypotheses are tested by using multiple regression analysis to explore the effects of KM infrastructure capability on KM effectiveness of doctors and also to identify the best predictor of KM effectiveness of doctors.

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Table 5 Model Summary for Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	ANOVA Sig.
1	0.741	0.549	0.516	0.408	0.000
Predictors: (constant), Organizational Culture, Organizational Structure, IT Support, Leadership & Strategy Dependent Variable: KM effectiveness of doctors.					

R square value or coefficient of determination shows the percentage variation in the dependent variable being explained by the changes in the independent variables ($R^2=0.549$). Therefore, 54.5% of changes in KM effectiveness of doctors is caused by all four elements of KM infrastructure capability. This confirms the effect of KM infrastructure capability on KM effectiveness of doctors.

R-value or multiple correlation coefficient shows the positive relationship between KM infrastructure capability and KM effectiveness of doctors ($R=0.74$).

The ANOVA output indicates the significance value as 0.000, which is less than 0.05 (at 95% confidence interval). Hence, the overall model is significant and the model construct is validated.

Table 6 Coefficients for Regression

Model	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig.
	B	Std. Error	Beta		
(Constant)	1.007	0.429		2.347	0.023
Organizational culture	0.301	0.122	0.293	2.456	0.017
Organizational Structure	0.298	0.097	0.359	3.078	0.003
IT Support	0.105	0.070	0.165	1.499	0.139
Leadership & Strategy	0.091	0.118	0.098	0.770	0.445
Dependent Variable: KM effectiveness of doctors					

The four independent variables were expressed in terms of standardized factor scores (beta coefficients). It is observed that organizational structure has high significant effect on KM effectiveness of doctors ($\beta=0.359$, $t=3.078$, $p<0.05$), followed by organizational culture ($\beta=0.293$, $t=2.456$, $p<0.05$) whereas other elements (IT support, leadership & strategy) do not have a significant effect on KM effectiveness of doctors. The beta values also show positive relationship (0.359 for organizational structure & 0.293 for organizational culture). Therefore, organizational structure and organizational culture were best predictors of KM effectiveness of doctors.

It is observed that one-unit increase in organizational culture would lead to a 0.301 unit increase in KM effectiveness of doctors. One-unit increase in organizational structure would lead to a 0.298 unit increase in KM effectiveness of doctors.

4.4. Summary of Data Analysis

The summary of hypotheses testing results is shown in **Table 7** below:

Table 7 The Summary of Findings

Hypotheses	<i>p</i> -value	Result
H1: There is a significant effect of organizational culture on KM effectiveness of doctors.	0.017	Accept
H2: There is a significant effect of organizational structure on KM effectiveness of doctors.	0.003	Accept
H3: There is a significant effect of IT support on KM effectiveness of doctors.	0.139	Reject
H4: There is a significant effect of leadership & strategy on KM effectiveness of doctors.	0.445	Reject

5. DISCUSSION AND CONCLUSIONS

This study aimed at exploring the effects of KM infrastructure capability on KM effectiveness of doctors. The finding confirms the significant effects of organizational culture and organizational structure on KM effectiveness of doctors.

According to Malhotra (1997), knowledge that is contained in the minds of employees is the greatest organizational resource. Cabrales et al. (2009) argued that Human Resource (HR) practices can improve the knowledge within organizations. Therefore, hospitals should develop and implement 'knowledge-centric HR practices' for stimulating and sustaining KM infrastructure capability. Accordingly, Hospitals can focus on the learning and development practices (sponsorship for higher studies, reimbursement of course / conference fee paid etc), on continuous basis, for encouraging doctors to update the knowledge and clinical skills. These practices increase the learning and innovation level of the hospital. HR practices such as job rotation and mentoring, needs to be emphasized for increasing the knowledge flow across various specialty. Such HR practices also increases the team work and the collaboration among doctors. Another important aspect is to motivate doctors for sharing their knowledge through reward & recognition schemes and measuring 'knowledge sharing' as a parameter in the performance appraisal.

In addition, hospitals need to develop IT-enabled KM systems (knowledge portal, tele-medicine, discussion forums, clinical decision support systems, etc) that focus on acquisition, sharing, storing and application of knowledge. Further, supportive leadership with effective KM strategy is also essential for driving KM initiatives.

KM infrastructure capability also stimulates KM process capability (acquisition, creation, sharing, storage and application of knowledge). KM capability (infrastructure and process) enhances KM effectiveness of doctors (timely and better decision making, evidence-based practices, reduced medical errors) and thereby delivers KM-enabled hospital performance (innovative and collaborative care, patient-centered care, improved patients safety and quality of care, reduced cost of care). Hence, the results of this study can be used by the hospitals for effective implementation of KM practices.

6. LIMITATIONS AND SCOPE OF FURTHER RESEARCH

The response rate was the limitation experienced in the study. The reason was the time constraint expressed by the doctors as respondents. Data was collected from doctors through face-to-face questionnaire, including during their consultation hours with the patients. It requires an additional effort for allocating few more days for data collection. Further research

is needed to explore the effects of KM process capability on KM effectiveness of doctors. It is also important to carry out detailed research on the relationships between KM capability (infrastructure and process) and KM-enabled hospital performance through the mediation effect of KM effectiveness of doctors.

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