

# PENETRATION AND PERFORMANCE OF INFORMATION TECHNOLOGY IN KNOWLEDGE MANAGEMENT PRACTICES: AN EMPIRICAL STUDY OF THE SOFTWARE SMES IN NORTH INDIA

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**Abstract Purpose:** The purpose of this study is to assess the penetration and performance of IT tools in the implementation of Knowledge Management Practices in Software SMEs.

**Design/Methodology/Approach:** Following Factor analysis, Descriptive analysis, and Regression analysis techniques, the study sourced its data from 80 Software SMEs of North India. The research instrument was created using the existing literature.

**Findings:** IT is an indispensable part of Knowledge Management Practices and applicability of Information Technology tools improved the Knowledge Management process by increasing the speed, accuracy, cost effectiveness, effective control and operational efficiency, and made the implementation of Knowledge Management Practices easier. IT provided the operational support to the Knowledge Management Practices by increasing the content visibility, proper documentation, completeness, and systematic storage of the knowledge. IT tools also provided better security and more reliability to the Knowledge Management system. The strategic development was the third important area of IT Enabled KM Practices in software industries. These IT enabled KM Practices enhanced the strategic development of the organization by improving KM process, competence, employee participation, decision support, Cross-unit performance and effective integration of systems.

**Research Limitations/Implications:** Study was restricted only to Software SMEs of North India.

**Keywords:** Knowledge, Knowledge Management (KM), Information Technology, IT Tools, Small and Medium Enterprises (SMEs).

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## 1. INTRODUCTION

The advancement in Information Technology had created the opportunity for organizations to use information systems to collect, organize, and synthesize knowledge in a manner that creates competitive advantage. Information Technology (IT) is widely employed to connect people with reusable codified knowledge and it facilitates conversations. It qualifies as a natural medium for knowledge flow. Knowledge Management's growth within organizations is closely aligned with the development of intranet, internet, emails, and web technologies. Many organizations have employed Information Technologies, known as Knowledge Management systems (KMS) for managing organizational knowledge. These IT-based systems support and enhance

the organizational processes of knowledge creation, storage, retrieval, transfer, distribution, application, indexing, categorizing, seeking related content, and flexibly expressing the content based on the various utilization backgrounds (Safa, *et al.*, 2006; Cavana *et al.*, 2001). Intranets and the internet are IT tools which allow communication by using applications like electronic mail, online discussions, and document management. Knowledge Management Portals and other Knowledge Management systems provide discussion boards for employee communication and collaboration. The various specialist software houses have developed complete Knowledge Management solutions and large software companies such as Microsoft and Lotus have marketed their groupware and Intranet products as supporting Knowledge Management Practices.

## 2. LITERATURE REVIEW

The applicability of Information technology in Knowledge Management implementation has been identified and proved by the researchers.

Agrawal (2010) has said that effective Knowledge Management requires an appropriate combination of institutional, social, and managerial initiatives along with deployment of appropriate technology. The study concluded that IT based Knowledge Management interventions increased opportunities for interdisciplinary research, provided updated information about new areas and fields of research, improved Practices based on research findings, enhanced networking with various organizations and improved corporate image. Knowledge Management principles along with Information Technology tools improved research results in commercialization and reduce turnaround time for research.

Crilly (2010) stated that IT support enhanced the organizational processes of knowledge creation, storage, retrieval, and transfer by coding and sharing of best Practices, e.g.: benchmarks; the creation of corporate knowledge directories, or mapping of internal expertise; and the creation of knowledge networks, for instance, by creating online forums in specialist areas. Technologies that support the Knowledge Management Practices include knowledge directories e.g., yellow pages and knowledge networks like electronic communities of practice, electronic knowledge repositories (EKR) which store codified knowledge for future reuse including databases about client and customers, industry best Practices and product knowledge.

Vaccaro (2010) analyzed the impact of Knowledge Management tools (KMTs) on the performance of business units involved in inter-firm collaborative innovation projects. It developed and empirically tested a model where: 1) the use of KMTs was affected by critical organizational variables, and 2) KMTs can impact the innovation and financial performance of business units. The research found that a more intense use of KMTs has a direct positive effect on new product performance and speed to market, as well as on financial performance. They elaborated that in addition, tools can help employees in reducing time of transfer knowledge, achieving higher efficiency, quality, and in enhancing employees' participation.

Mathew (2009) defined that Information Technology played a crucial role in organizing, sharing, collaboration, categorizing, dissemination and storing of knowledge which can later be retrieved and accessed as meaningful across different contexts.

Matlay & Martin (2009) examined through an illustrative longitudinal case study of a pan-European virtual team

comprising of 24 E-Entrepreneur members, and evaluated emergent collaborative and competitive strategies used in small e-Businesses. It reported that SMEs use internet to facilitate online knowledge-sharing in extensions of existing networks or entirely new "virtual" initiatives.

Schneckenberg (2009) discussed that IT tools like Web 2.0 tools, in particular Wikis, Blogs, and Real Simple Syndication (RSS) enhance communication with the customers and suppliers on core business processes like product design and development and they encourage collaboration and knowledge exchange between employees.

Song (2009) has demonstrated in the research paper that IT infrastructure facilitates knowledge sharing, knowledge creation, knowledge storage, and knowledge transfer through better internal communication flows. Andersson (2009) highlighted in their conceptual framework, IT systems as one of the seven potential mechanisms to assimilate repatriate knowledge.

Sáenz (2009) applied Structural Equation Modeling (SEM) based on Partial Least Squares (PLS), and highlighted that Information Technology, employees and processes have a positive effect on knowledge sharing effectiveness. Technology intensity moderates the degree of relevance of each innovation capability in value creation.

Ahmad (2009) used the qualitative approach by interviewing software industries. It concluded that information technology may serve as a cost effective and fast medium to acquire, store, share, and transfer knowledge. Information technology played a role in leveraging knowledge in the company and helps to create new knowledge.

Guerra (2009) used multilevel analysis on thirty-two participants among managers and employees from the eight international subsidiaries of the PROACT Group and discussed that IT system was a mechanism with an intranet platform that allows to access different units transfer, and adopt knowledge in an efficient way in terms of cost reduction, time saving, information storage, and increasing networking.

Based on this, the following hypotheses were developed:

**H1:** Information Technology is an indispensable part of Knowledge Management Practices.

**H2:** IT tools positively influence the performance of Knowledge Management Practices.

## 3. RESEARCH METHODOLOGY

The study had been conducted by using both primary data which was collected through structured questionnaire. The primary data is supported by the secondary data collected from various research articles, company websites and

**Table 1: Measurement Items of Penetration of IT in Knowledge Management Practices**

Construct	Penetration of IT in KM Practices (IT)	
Label	Measurement items	Sources
IT1	IT facilitates the processes of capturing, categorizing, and retrieving knowledge and ideas	<ul style="list-style-type: none"> <li>• Goh (2010)</li> <li>• Crilly (2010)</li> <li>• Vaccaro (2010)</li> <li>• Schneckenberg (2009)</li> <li>• Guerra (2009)</li> <li>• Sáenz (2009)</li> <li>• Wang, (2009)</li> <li>• Mathew (2009)</li> <li>• Song (2009)</li> <li>• Huimin (2008)</li> <li>• Ray (2008)</li> <li>• Easterby-Smith (2008)</li> <li>• Vaast (2007)</li> <li>• Hansen (2007)</li> </ul>
IT2	IT tools are used to access external information and knowledge on competitors and market changes	
IT3	IT tools facilitate communications effectively when face-to-face communications are not convenient	
IT4	IT tools increase the accuracy and speed of classifying knowledge	
IT5	IT tools enhance the visibility of knowledge	
IT6	IT tools reduce the risks of not finding key knowledge	
IT7	IT tools quickly find documents and people in the organization who have specific knowledge	
IT8	IT tools support for collaborative works regardless of time and place	
IT9	IT tools support systematic storing	
IT10	IT tools provides faster respond of queries	

Source: Field investigation

**Table 2: Information Technology Tools**

Label	Item	Sources
TO1	Intranet	• Murat Sezgin (2009), Patricia (2009), Robertson (2009), Nie <i>et al.</i> (2007),Ruikar <i>et al.</i> , (2007),Gooderham (2007)
TO2	Internet	• Matlay & Martin (2009), Murat Sezgin (2009), Saito <i>et al.</i> , (2007), Hsia <i>et al.</i> , (2006)
TO3	KM Portals	• Priti Jain (2009), Saito (2007), Daghfous and Kah (2006), Hsia (2006)
TO4	DBMS/KBS	• Murat Sezgin (2009), Agbeja and Fajemisin (2008), Ruikar <i>et al.</i> , (2007), Hsia <i>et al.</i> , (2006)
TO5	Groupware	• Janson et al (2008), Cheah (2007)
TO6	Data Warehouse/ Mining	• Murat Sezgin (2009), Nie (2007), Ruikar (2007), Hsia <i>et al.</i> , (2006)
TO7	E-Document Management System	• Crilly et al (2010), Murat Sezgin (2009), Hsia <i>et al.</i> , (2006), Bernard (2006)
TO8	Dedicated KM tools/ software	• Omona (2010), Gurteen (2008)

annual reports, internet, magazines, newspapers, and other publications.

100 Software SMEs with successful Knowledge Management practices had been taken by a judgmental cum convenience sampling. Out of the 100 SMEs in our sample, 85 responses were received. Out of 85 responses, 5 responses were invalid as questionnaire was not complete. 80 responses were found to be usable. The response rate was 80%. The top level managers like Chief Executives, Chief Knowledge Officers (CKO), Chief Information Officers (CIO), HR executives, and other management experts of the organization were contacted to get the questionnaire filled.

### 3.1 Research Instrument

The first part of the instrument measured the penetration of Information Technology tools in Knowledge Management Practices. The first question contained ten measurement statements (Table 1). These statements were rated on five point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1).

In the second part, respondents were further asked to specify the extent of use of IT tools used in the organization for Knowledge Management implementation (Table 2). This was

**Table 3: Performance of IT Enabled Knowledge Management Practices**

Construct	Performance of IT Enabled KM Practices(PI)	
Label	Measurement items	Source
PI1	Speed and Accuracy	• Agrawal et al (2010)
PI2	Easy	• Crilly et al (2010)
PI3	Reliability	• Vaccaro et al (2010)
PI4	Visibility	• Song (2009)
PI5	Security	• Ahmad, et al (2009)
PI6	Cost effectiveness	• Guerra (2009)
PI7	Control	• Hsu (2008)
PI8	KM Process improvement	• Rai <i>et al.</i> (2006)
PI9	Employee participation	• Wu et al (2006)
PI10	Decision support	• Tanriverdi (2005)
PI11	Operational efficiency	
PI12	Documentation	
PI13	Cross- unit performance	
PI14	Competence	
PI15	Completeness	
PI16	Integration of systems	
PI17	Systematic storage	

Source: Field investigation

rated on five point Likert scale ranging from Very high(5) to Very low(1).

The third part dealt with the performance implications of IT Enabled KM Practices. The measurement items were speed, accuracy, easy, reliability, visibility, security, control, cost effectiveness, KM process improvement, decision support, employee participation, operational efficiency, documentation, cross-unit performance, competence, completeness, systematic storage, and integration of systems. These items were rated on five point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1).

### 3.2. Reliability of the Instrument

The reliability test was carried out to determine the quality of the measurement items. Cronbach's Alpha method was used to assess the reliability of the instrument (Table 4). The statistics tests showed that Cronbach's alpha of the constructs varied between value 0.75 to 0.819 indicating satisfactory internal consistency reliability. Relatively high values of reliability implied that the instruments used in this study were adequate.

**Table 4: Reliability of the Instrument**

Sr No	Construct	Cronbach's Alpha
1	Penetration of Information Technology in KM Practices (IT)	.819
2	IT Tools(TO)	.75
3	Performance of IT Enabled KM Practices (PI)	.816

## 4. FINDINGS OF THE STUDY

### 4.1. Penetration of IT in Knowledge Management Practices

This study provided initial insights into the extent of use of Information Technology tools by Software SMEs for knowledge capturing, sharing, transferring, storing, and reuse. The ten statements are rated on five point Likert scale ranging from Strongly Agree (5) to strongly disagree (1).

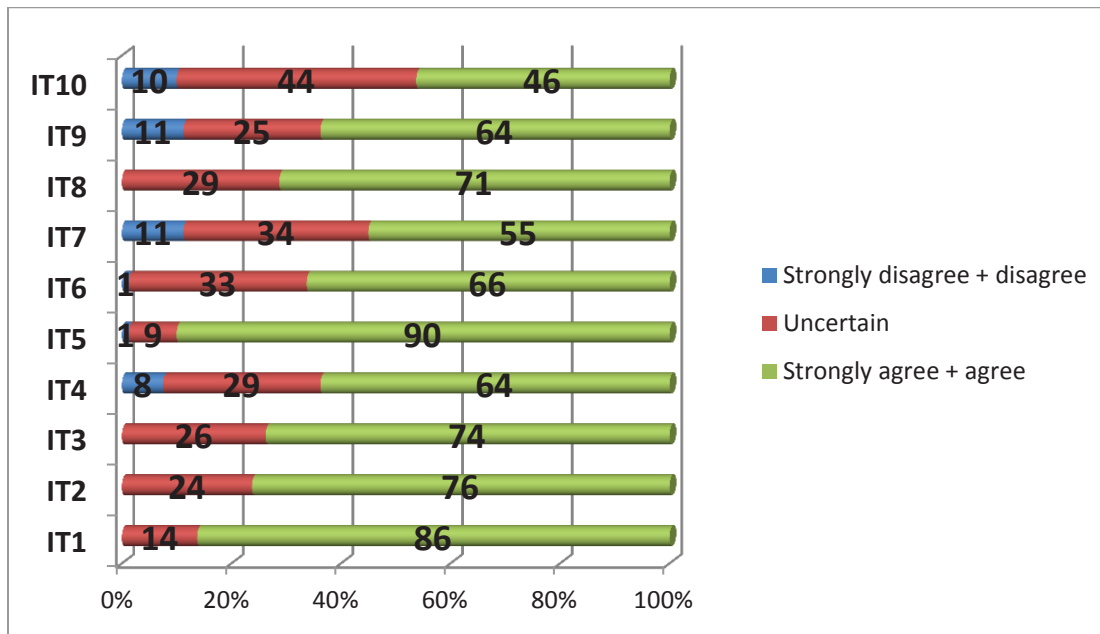
Figure 1 proves that IT was an indispensable part of Knowledge Management Practices in Software SMEs. IT enhanced the visibility of knowledge (90%) and facilitated

**Table 5: Penetration of IT in Knowledge Management Practices in Software SMEs**

Label	Strongly disagree (%)	Disagree (%)	Uncertain (%)	Agree (%)	Strongly Agree (%)
IT1	-	-	11(13.75)	37(46.25)	32(40)
IT2	-	-	19(23.75)	37(46.25)	24(30)
IT3	-	-	21(26.25)	32(40)	27(33.75)
IT4	-	6(7.5)	23(28.75)	25(31.25)	26(32.5)
IT5	-	1(1.25)	7(8.75)	42(52.5)	30(37.5)
IT6	-	1(1.25)	26(32.5)	34(42.5)	19(23.75)
IT7	2(2.5)	7(8.75)	27(33.75)	31(38.75)	13(16.25)
IT8	-	-	23(28.75)	31(38.75)	26(32.5)
IT9	-	9(11.25)	20(25)	24(30)	27(33.75)
IT10	-	8(10)	35(43.75)	18(22.5)	19(23.75)

Source: Field investigation (SPSS 16.0)

**Figure 1: Penetration of IT in Knowledge Management Practices in Software SMEs**



the processes of capturing, categorizing, and retrieving knowledge and ideas in the organization (86%). 76% of the respondents felt that IT tools helped in accessing external information and knowledge on competitors and market changes.

74% of the respondents revealed that IT tools facilitated communications and support for collaborative works regardless of time and place (71%).

66% of the respondents agreed that IT tools reduced the risks of not finding key knowledge and increase the accuracy and

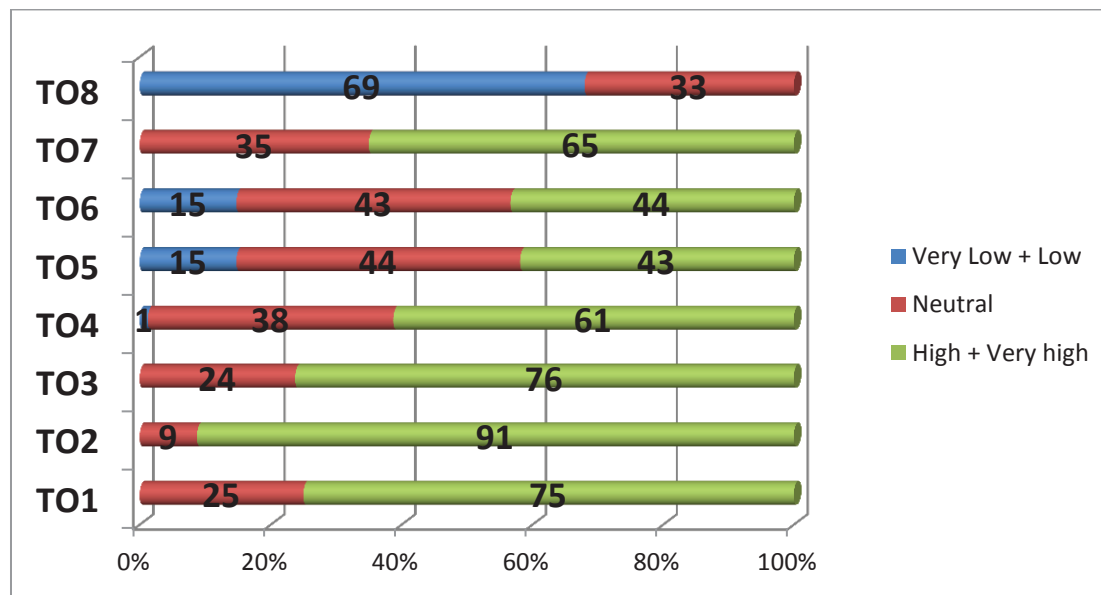
speed of classifying knowledge and systematic knowledge storage (64%).

Approximately half of the respondents (55%) supported that IT tools quickly found documents and people in the organization that had specific knowledge and helped in providing faster response to their queries (46%).

The above results showed that IT was indispensable part of Knowledge Management Practices and hence H1 was accepted in context of Software SMEs.

**Table 6: Use of IT tools in Knowledge Management Practices**

Label	Very Low (%)	Low (%)	Neutral (%)	High (%)	Very High(%)
TO1	-	-	25(25)	27(33.75)	33(41.25)
TO2	-	-	7(8.75)	33(41.25)	40(50)
TO3	-	-	19(23.75)	33(41.25)	28(35)
TO4	-	1(1.25)	30(37.5)	27(33.75)	22(27.5)
TO5	1(1.25)	11(13.75)	34(42.5)	29(36.25)	5(6.25)
TO6	1(1.25)	11(13.75)	34(42.5)	29(36.25)	5(6.25)
TO7	-	-	28(35)	25(31.25)	27(33.75)
TO8	21(26.25)	33(41.25)	26(32.5)	-	-

**Figure 2: IT Tools Used in Knowledge Management Practices by Software SMEs**

Source: Field investigation

#### 4.2. IT Tools used for Implementing Knowledge Management Practices

A wide variety of tools were available for the Knowledge acquisition, creation, sharing, storage, and reuse. The eight tools were selected from literature review that suited to the environment of SMEs. These tools were rated on five point Likert scale i.e., very high-very low. The descriptive statistics were used to identify the use of various IT tools.

In Software industry 91% of executives used the internet to access external knowledge and intranet for internal knowledge (75%). It was reported that respondents used email for exchanging documents and various search engines to access published documents on networks. The e-mail was the critical tool for disperse project teams and the inbox

folder of the project manager was the central repository for all the knowledge assets in the project team. Most of the flow of documents during a normal project implementation among the project team members happened via e-mail.

Software SMEs relied heavily on intranets for pulling capabilities of knowledge assets. They used intranets in different forms ranging from comprehensive, all-encompassing sites to the relatively low-cost sites depending on their size and budget. These intranets sites supported the sharing of best practices, led to more-informed decisions, and served as the primary channel for internal communications. The professional services like statements of work, project plans, requirements, documents, technical specifications, and post-mortem lessons learned was uploaded on intranet site of the organization when the project was closed.

**Table 7: KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.89
Bartlett's Test of Sphericity	Approx. Chi-Square	7979.64
	df	136
	Sig.	.000

Source: Field investigation (SPSS 16.0)

**Table 8: Naming of Factors and Factor Loadings**

Factor	Label	Measurement items	Factor loading	Eigen Value	% of var
Operational support	PI3	Reliability	0.963	5.650	33.236
	PI4	Content Visibility	0.946		
	PI5	Security	0.973		
	PI12	Documentation	0.946		
	PI15	Completeness	0.982		
	PI17	Systematic storage	0.988		
Strategic development	PI8	KM Process improvement	0.956	5.274	31.024
	PI9	Employee participation	0.952		
	PI10	Decision support	0.990		
	PI13	Cross- unit performance	0.990		
	PI14	Competence	0.990		
	PI16	Integration of systems	0.990		
Process improvement	PI1	Speed and Accuracy	0.985	4.653	27.370
	PI2	Easy	0.948		
	PI6	Cost effectiveness	0.919		
	PI7	Control	0.970		
	PI11	Operational efficiency	0.964		
Total variance					91.628

Respondents also verified that intranets had a significant effect on workforce efficiency and productivity.

76% of the respondents agreed that Knowledge Portal was widely used by Software SMEs to support Knowledge Management initiatives. It facilitates the virtual interaction of employees and provides technological solution without altering their work schedules. The cross team projects, process and meetings with supervisors, managers and executive teams, posted on KM portal led to time and resource saving and provided employees with the context they desire. The respondents admitted that KM portal assisted in accessing administrative information, statistics data and current events related to the organization. It acted as a catalyst in downloading and uploading of publications, reports, experience, and ideas. It also provided the mechanism to respond the queries of the employees and to make certain payments online. The various administrative forms and applications could be downloaded and filled easily with the KM Portal.

65% of the respondents used the e-documentation system. It helped software enterprises in managing electronic records and documents that ensure compliance with regulations and standards. 61% of the respondents use database management system for facilitating the storage and retrieval of required documents instantly. But approximately less than half of the respondents used data warehousing (44%) and groupware techniques (43%) for implementing Knowledge Management Practices. The technologies that ranked lowest by the respondents were dedicated KM tools. The study showed that dedicated KM tools were rarely used and it was perceived as being complex and of little use for the SMEs.

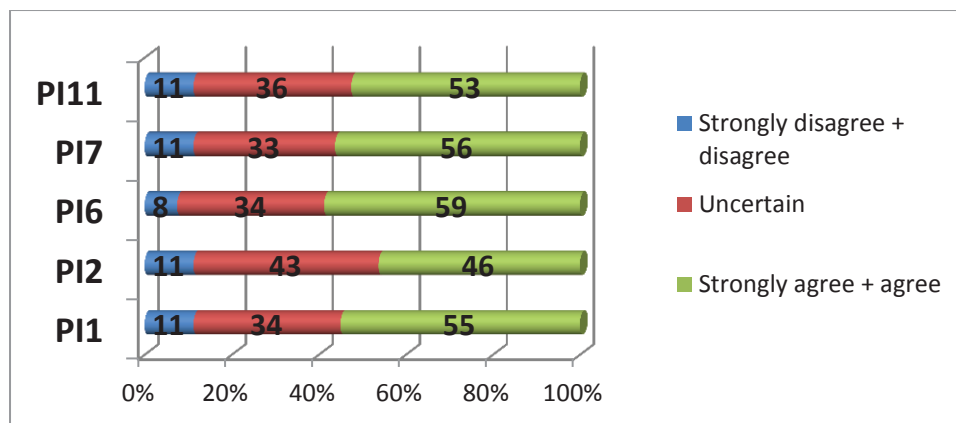
### 4.3. Performance of Information Technology in Knowledge Management Practices

The seventeen measurement items were taken from previous literature. These items were reduced using exploratory factor analysis. Principal component analysis was adopted

**Table 9: Performance of IT in Knowledge Management Practices in Software SMEs**

Factor	Label	Strongly disagree (%)	Disagree (%)	Uncertain (%)	Agree (%)	Strongly agree (%)
Process improvement	PI1	2(2.5)	7(8.75)	27(33.75)	31(38.75)	13(16.25)
	PI2	2(2.5)	7(8.75)	34(42.5)	27(33.75)	10(12.5)
	PI6	1(1.25)	5(6.25)	27(33.75)	33(41.25)	14(17.5)
	PI7	2(2.5)	7(8.75)	26(32.5)	29(36.25)	16(20)
	PI11	2(2.5)	7(8.75)	29(36.25)	30(37.5)	12(15)
Operational support	PI3	-	9(11.25)	24(30)	22(27.5)	25(31.25)
	PI4	-	8(10)	20(25)	26(32.5)	26(32.5)
	PI5	-	9(11.25)	23(28.75)	21(26.25)	27(33.75)
	PI12	-	9(11.25)	20(25)	27(33.75)	24(30)
	PI15	-	9(11.25)	20(25)	24(30)	27(33.75)
	PI17	-	9(11.25)	20(25)	24(30)	27(33.75)
Strategic development	PI8	-	21(26.25)	34(42.5)	25(31.25)	-
	PI9	-	19(23.75)	33(41.25)	27(33.75)	1(1.25)
	PI10	-	20(25)	31(38.75)	28(35)	1(1.25)
	PI13	-	22(27.5)	31(38.75)	26(32.5)	1(1.25)
	PI14	-	28(35)	27(33.75)	25(31.25)	-
	PI16	-	26(32.5)	30(37.5)	23(28.75)	1(1.25)

Source: Field investigation (SPSS 16.0)

**Figure 3: Process Improvement due to use of IT Tools in Knowledge Management Practices in Software SMEs**

Source: Field investigation

for extracting the factors based on latent Root Criterion (i.e., Eigen value >1). The Kaiser-Meyer-Olkin measure of sampling adequacy was conducted for comparing the magnitudes of the observed correlation coefficients to the magnitudes of the partial correlation coefficients. Large values for the KMO measure indicated that a factor analysis of the variables was a good idea.

KMO equals to .89 at significance level of .000 with chi-square 7979.64 showing that the degree of common variance

among the variables is quite high; therefore factor analysis could be conducted.

Three factors were having Eigen values more than one. The percentages of variance extracted by factor 1 to 3 were 33.236, 31.024, and 27.370 respectively. The cumulative percentage of variance accounted for 91.628 % of the total variations extracting 3 factors from 17 variables. The three extracted factors had been allotted appropriate name on the

**Table 10: Prediction Table for Process Improvement Based on IT Tools in Software SMEs**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1(Constant)	.346	.273		1.265	.210
IT Tools	.911	.093	.744	9.835	.0001

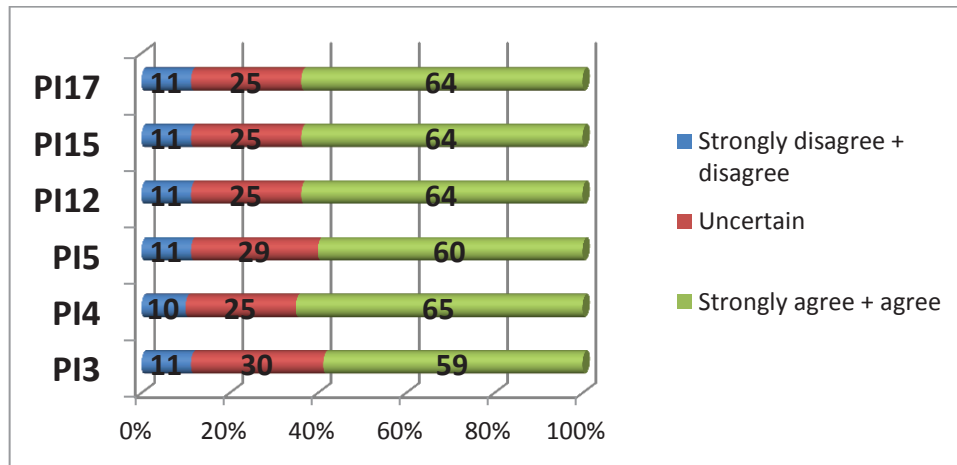
Dependent variable: Process improvement

**Table 11: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.744a	.554	.548	.31320

Predictors: (Constant), IT Tools

**Figure 4: Operational Support Provided by IT tools in Knowledge Management Practices in Software SMEs**



Source: Field investigation

basis of the underlying items. The names of the factors and factor loadings have been summarized in table 8.

**Factor I: Operational support** represented the operational support for Knowledge Management Practices and included six items, i.e., reliability, content visibility, security, documentation, completeness, and systematic storage explaining 33.236% of the total variance.

**Factor II: Strategic development** included Competence, KM Process improvement, Employee participation, Decision support, Cross-unit performance and Integration of systems explaining 31.024 % of the total variance.

**Factor III: Process improvement** illustrated KM process improvement and included five measurement items i.e., speed and accuracy, Easy, cost effectiveness, control and

operational efficiency explaining 27.370 % of the total variance

The use of IT tools in Knowledge Management Practices leads to process improvement, provides operational support to Knowledge Management Practices and enhances strategic development of the organization.

**4.3.1. Process Improvement (PRI)**

Process improvement factor included five measurement items, i.e., speed and accuracy, easy, cost effectiveness, control, and operational efficiency which were labeled as P1, P2, P6, P7, and P11. The percentage responses of these items were represented in figure 3.

Information Technology tools improved the Knowledge Management process by increasing the speed and accuracy (55%), cost effectiveness (59%), better control (56%), and operational efficiency (53%). 46% of the respondents felt that IT tools made the implementation of Knowledge Management Practices easier.

**4.3.2. Regression Analysis**

The regression analysis had been conducted to find the impact of IT tools on the process improvement. As both the constructs included number of items, so the sum was computed for regression analysis. In this technique, “IT Tools” construct acts as independent variable and “process improvement” as dependent variable.

It was evident from the tables 10 and 11 that calculated t (9.835) was significant at (0.001) level. The coefficient of IT Tools was .911, meaning that for a one unit increase in IT Tools we would expect a .911 unit increase in “process improvement”. The R-squared was .554 which meant that approximately 55% of the variance of “process improvement” was accounted by the IT Tools that were acceptable. The adjusted R-squared indicated that about 54% of the variability of “process improvement” was accounted by the model. The effect of IT Enabled Knowledge Management practice on Process improvement in Software SMEs could be derived from the equation 1.

Equation 1: Process improvement = .346 +.911 (IT Tools) + e.

**4.4. Operational Support**

Operational Support factor included six items i.e. reliability, content visibility, security, documentation, completeness, and systematic storage which were labeled as P3, P4, P5, P12, P15, and P17. The percentage responses of these items were represented in figure 4.

IT provided the operational support to the Knowledge

Management Practices by increasing the content visibility (65%), documentation, completeness and systematic storage (64%) of the knowledge. 60% of the respondents agreed that IT tools provides the better security and more reliability (59%) to the Knowledge Management system.

**4.4.1. Regression Analysis**

Regression Analysis had been conducted to find the impact of IT tools on the second factor i.e. operational support. As both the constructs include number of items, the sum was computed for regression analysis. In this technique, “IT tools” construct acts as independent variable and “operational support” as dependent variable.

The regression analysis suggested that calculated t (15.743) of IT tools was significant at (0.001) level. The coefficient of IT Tools was 1.025 which meant that for a one unit increase in IT Tools, we would expect a 1.025 unit increase in the variable “operational support”. The R-squared equals to .761, which means that approximately 76% of the variance of “operational support” was accounted by the IT Tools that were acceptable. The adjusted R-squared indicates that about 75% of the variability of “operational support” was accounted by the model. The effect of IT Enabled Knowledge Management practice on Operational support in Software SMEs could be derived from the equation 2

Equation 2: Operational Support= .065 +1.025(IT Tools) + e.

**4.4.2. Strategic Development**

The third extracted factor Strategic Development included items, i.e., competence, KM process improvement, employee participation, decision support, cross-unit performance and integration of systems which were labeled as P8, P9, P10, P13,P14, and P16. The percentage responses of these items were represented in figure 5.

Figure 5 represented that strategic development was

**Table 12: Prediction Table for Operational Support based on IT tools in Software SMEs**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1(Constant)	.065	.192		.338	.736
IT Tools	1.025	.065	.872	15.743	.0001

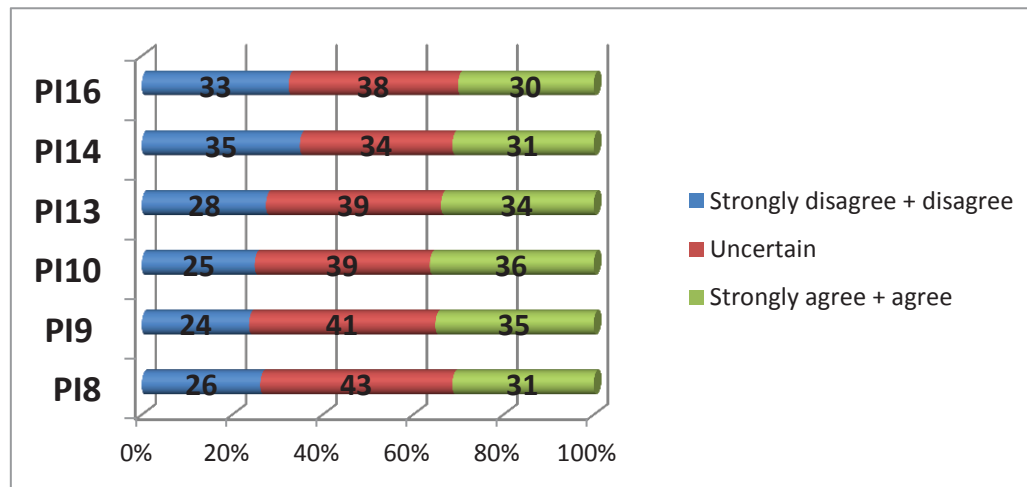
Dependent variable: operational support

**Table 13: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.872a	.761	.758	.22022

Predictors: (Constant), IT Tools

Figure 5: Strategic Development Using IT Tools in Knowledge Management Practices in Software SMEs



Source: Field investigation

Table 14: Prediction Table for Strategic Development Based on IT tools

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1(Constant)	.224	.443		.505	.615
IT Tools	.890	.150	.558	5.933	.0001

Dependent variable: Strategic development

Table 15: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.558 <sup>a</sup>	.311	.302	.50740

Predictors: (Constant), IT Tools

the third important area of IT Enabled KM Practices in industry. Nearly 30% of the respondents agreed that IT enabled KM Practices enhance the strategic development of the organization by improving KM process, competence, employee participation, decision support, Cross-unit performance, and better integration of systems.

#### 4.4.3. Regression Analysis

Regression Analysis had been conducted to find the impact of IT tools on the third extracted factor, i.e., strategic development. As both the constructs include number of items, the sum was computed for regression analysis. In this technique, “IT tools” construct acts as independent variable and “Strategic development” as dependent variable.

The regression analysis suggested that calculated t (5.933) of IT tools was significant at (0.001) level. The coefficient of IT tools was .890 which means that for a one unit increase

in IT tools, we would expect a .890 unit increase in the variable “Strategic development”. The R-squared equals to .311, which means that approximately 31% of the variance of “Strategic development” was accounted for by the IT tools that were acceptable. The adjusted R-squared indicates that about 30% of the variability of “Strategic development” was accounted by the model. The effect of IT Enabled Knowledge Management practice on Strategic development in Software SMEs can be derived from the equation 3.

$$\text{Equation 3: Strategic development} = .224 + .890(\text{IT Tools}) + e.$$

Based on these results, hypothesis H2 viz., IT tools positively influenced the performance of Knowledge Management Practices was accepted in Software SMEs.

## 5. CONCLUSION

Information Technology was an indispensable part of Knowledge Management Practices in Software SMEs.

IT enhanced the visibility of knowledge and facilitates the processes of capturing, categorizing, and retrieving knowledge and ideas in the organization. IT tools help in accessing external information and knowledge on competitors and market changes. IT tools facilitated communications and support for collaborative works regardless of time and place. The study found that IT tools reduced the risks of not finding key knowledge and increase the accuracy and speed of classifying knowledge and systematic knowledge storage. Approximately half of the respondents supported that IT tools quickly found documents and people in the organization that had specific knowledge and helped in providing faster response to their queries.

A wide variety of tools were used for the Knowledge acquisition, creation, sharing, storage, and reuse in software industry. The internet was widely used to access external knowledge and intranet for internal knowledge. It was reported that respondents used email for exchanging documents and various search engines to access published documents on networks. The e-mail was the critical tool for disperse project teams and the inbox folder of the project manager was the central repository for all the knowledge assets in the project team. Most of the flow of documents during a normal project implementation among the project team members happened via e-mail.

Software SMEs relied heavily on intranets for pulling capabilities of knowledge assets. They used intranets in different forms ranging from comprehensive, all-encompassing sites to the relatively low-cost sites depending on their size and budget. These intranet sites supported the sharing of best Practices, led to more-informed decisions, and served as the primary channel for internal communications. The professional services like statements of work, project plans, requirement documents, technical specifications, and post-mortem lessons learned was uploaded on intranet site of the organization when the project was closed. Respondents also verified that intranets had a significant effect on workforce efficiency and productivity.

Knowledge Portal was widely used by Software SMEs to support Knowledge Management initiatives. It facilitated the virtual interaction of employees and provided technological solution without altering their work schedules. The cross team projects, process and meetings with supervisors, managers and executive teams, posted on KM portal led to time and resource saving and provide employees with the context they desire. The respondents admitted that KM portal assists in accessing administrative information, statistics data and current events related to the organization. It acted as a catalyst in downloading and uploading of publications, reports, experience, and ideas. It also provided the mechanism to respond the queries of the employees and to make certain payments online. The various administrative

forms and applications could be downloaded and filled easily with the KM Portal.

The E-documentation system and database management system were other tools for storing the data and knowledge in systematic manner. But approximately less than half of the SMEs use data warehousing and groupware techniques on regular basis for implementing Knowledge Management Practices. The technologies that ranked lowest by the respondents were dedicated KM tools. The study showed that dedicated KM tools were rarely used and it was perceived as being complex and of little use for the Software SMEs.

Information Technology tools improved the Knowledge Management process by increasing the speed, accuracy, cost effectiveness, effective control, and operational efficiency and made the implementation of Knowledge Management Practices easier. IT provided the operational support to the Knowledge Management Practices by increasing the content visibility, proper documentation, completeness, and systematic storage of the knowledge. IT tools provided the better security and more reliability to the Knowledge Management system. The strategic development was the third important area of IT Enabled KM Practices in software industry. These IT Enabled KM Practices enhanced the strategic development of the organization by improving KM process, competence, employee participation, decision support, Cross-unit performance, and effective integration of systems.

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