

Knowledge Management in Software Companies—An Appraisal

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Abstract—The present study involved evaluation of state of knowledge management implementation in two software organizations. The awareness levels of knowledge management as well as degree of acceptance in these organizations were also assessed. A questionnaire approach was used for data collection. The results indicated that employees were aware of the Knowledge Management system in the organization. They were of the opinion that it is an effective way of creating and organizing corporate knowledge. The majority of the respondents felt that this major organizational strategy would benefit their organization.

Index Terms—Knowledge management system, software company, awareness, knowledge quality.

I. INTRODUCTION

In the current economy, knowledge is recognized as very crucial. This knowledge economy has brought power to employees. Consequently, for an organization to be innovative as well as to sustain the competitive edge there is a need to effectively utilize this valuable asset, knowledge. Knowledge comes from information processed by using data. It includes individuals' experiences, values, insights, and contextual information and helps to evaluate and incorporate new experiences and information [1]. Knowledge is a powerful resource that enables organizations and employees to achieve faster learning and develop better decision-making.

Knowledge exists when data and information are applied [2]. According to Nonaka and Takeuchi [3], knowledge can be tacit or explicit. Tacit knowledge is knowledge that is difficult to transfer to another person by means of writing it down or verbalizing it. Tacit knowledge refers to a knowledge which is only known by an individual and that is difficult to communicate to the rest of an organization. Explicit knowledge, on the other hand, is knowledge that has been or can be articulated, codified, and stored in certain media. It can be readily transmitted to others.

Presently, there is a paradigm shift from knowledge being equated with power to an era of knowledge sharing. The knowledge inherent to business processes is essential to the daily functions of an organization. This knowledge may be found in company databases, management documents and

history files and in the minds of employees. Often this knowledge is dispersed throughout the organization in unconnected databases.

It thus becomes imperative to convert tacit knowledge to explicit knowledge, which can be done by knowledge management. Knowledge Management is the discipline of enabling individuals, teams and entire organizations to collectively and systematically create, share and apply knowledge to better achieve their objectives [4].

Knowledge Management System (KMS) refers to an IT based system for managing knowledge in organizations for supporting creation, capture, storage and dissemination of information. The idea of a KMS is to enable employees to have ready access to the organization's documented base of facts, sources of information, and solutions [5].

Organizations can achieve enormous direct and indirect benefits from knowledge management system (KMS) deployment [6]. These include improved decision making, decision consistency and speed, increased production, job satisfaction, cost savings and competitive advantage [7].

The transfer of technical and managerial knowledge aims to provide competencies as well as define customer needs and provide customized solutions. Software companies in particular face an enormous challenge compounded by the need to align the rapidly evolving technologies with the business objectives. KMS software is currently being used in a few software companies. 'Kshop' by Infosys was first launched in 1999. Through Kshop, knowledge generated in each project across the global operations of Infosys was captured [8]. 'Lotus notes' by IBM, which was launched by IBM in 1995, is being sold and used by IBM in each department across its global software group. 'Microsoft enterprise search' is commercial KMS software launched by Microsoft.

The software industry is constantly seeking methods to improve productivity and software quality. One approach to building better software products is software process improvement. The fundamental belief of software process improvement is that improving the process will lead to improvements in the final product. A basic idea is to assess the organizations' current practice and improve their software process on the basis of the knowledge, competencies and experiences of the practitioners working in the organization.

II. OBJECTIVES

The Indian software industry is rated very high in terms of human resource as a tangible strategic asset. Hence, the objective of the present study was to carry out a survey on the existing knowledge management initiatives of two software companies. The findings of the study may provide

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insight into the effective utilization of knowledge management initiatives by all strata of knowledge workers.

III. METHODOLOGY

The data was conducted by web survey. Two major software companies were selected for the purpose. A sample size of 25 was determined for each company. About 150 questionnaires were sent and the response rate was 33%. Stratified sampling method based on the designation of employees was used in the survey.

The questionnaire was reviewed for bias and questions were framed to be uniformly understood by all respondents belonging to different strata in the organization. The questionnaire used was found to be reliable with proven ‘content and criterion related’ validity. The content validity was checked by consultation with experts in the software field. ‘Item validation’ was carried out through ‘Factor Analysis’, the purpose of which was to determine the internal structure of the set of given number of items. Principal Component Analysis (PCA) method with varimax rotation using Kaiser variation was used to generate factors [Table I and Table II].

TABLE I: COMMUNALITIES

	Initial	Extraction
HIGH QUALITY OF KNOWLEDGE	1.000	.686
KNOWLEDGE CAPTURED IS ACCURATE	1.000	.698
KMS ALLOWS KNOWLEDGE DEVELOPMENT	1.000	.704
KMS HAS ADDED TO RESPONSIBILITIES	1.000	.879
KMS HAS INCREASED INNOVATION IN PROCEDURES	1.000	.601
KM SIGNIFICANTLY SATISFIES SEARCH FOR KNOWLEDGE	1.000	.647
KMS IS USER FRIENDLY	1.000	.574
KMS IS VITAL FOR COMPANY SUCCESS	1.000	.420
KMS HAS LED TO IMPROVEMENT IN MARKET SHARE	1.000	.643

IV. RESULTS AND DISCUSSION

10 parameters were chosen from the survey according to their relevance in deriving appropriate conclusions for the project. Analysis was carried out using SPSS software.

The following scales were used to measure the response of each respondent. The respondents were evaluated based on their familiarity with Knowledge Management as

Introductory, Intermediate and Advanced users represented respectively as 1, 2 and 3. The other 9 parameters were assessed using the Likert 5 - point scale with 1 for Strongly disagree, 2 for Disagree, 3 for Neither agree nor disagree, 4 for Agree and 5 for Strongly agree.

During analysis, ‘Familiarity with KMS’ was assumed as an independent parameter and the rest of the parameters were assumed to be dependent on this parameter. Table III shows the mean values of all the parameters and standard deviation of the values from the mean value.

TABLE II: COMPONENT MATRIX *

	COMPONENT		
	1	2	3
HIGH QUALITY OF KNOWLEDGE	.429	-.353	.614
KNOWLEDGE CAPTURED IS ACCURATE	.594	-.486	.329
KMS ALLOWS KNOWLEDGE DEVELOPMENT	.691	-.472	-.057
KMS HAS ADDED TO RESPONSIBILITIES	-.091	.709	.607
KMS HAS INCREASED INNOVATION IN PROCEDURES	.652	.326	-.265
KMS SIGNIFICANTLY SATISFIES SEARCH FOR KNOWLEDGE	.648	.367	.304
KMS IS USER FRIENDLY	.697	.211	-.208
KMS IS VITAL FOR COMPANY SUCCESS	.595	.156	-.205
KMS HAS LED TO IMPROVEMENT IN MARKET SHARE	.764	.185	-.158
Extraction Method: Principal Component Analysis.			
*3 components extracted.			

A. Analysis of Survey Questions

For the question on “Level of experience and familiarity with KM”, out of the total number of responses taken into account i.e. 50, 15 respondents chose Introductory, 23 respondents chose intermediate and 12 respondents chose advanced. The majority, 46% of the respondents, chose Intermediate level.

B. Parameter 1: High Quality of Knowledge

26 respondents agreed while 24 strongly agreed. None of the respondents disagreed with the statement. 52% of respondents agree that a high quality of knowledge exists in the organization.

A mean value of 4.47 and standard deviation of 0.516 was seen for introductory level of familiarity. For intermediate level of familiarity the mean value reduces to 4.43 and for advanced level of familiarity the mean value is 4.75. Thus the highest mean value is for advanced users. The total mean value is relevant, which is 4.52 with a standard deviation of 0.505. This value tells us that 100 % of respondents agree or strongly agree with the statement.

The results for this question show us that these companies using KMS have a high quality of knowledge which is accessible to the various strata within the organization. The

findings are in accordance to De Lone and McLean [9], who indicated that KMS success depends on information quality and system quality.

TABLE III: MEAN VALUES OF PARAMETERS

	Own level of familiarity with KMS	High quality of knowledge	Knowledge captured is accurate	KMS allows knowledge development
1	Mean	4.47	4.27	3.93
	N	15	15	15
	Std. Deviation	.516	.458	.594
2	Mean	4.43	4.17	4.30
	N	23	23	23
	Std. Deviation	.507	.388	.559
3	Mean	4.75	4.92	4.58
	N	12	12	12
	Std. Deviation	.452	.289	.515
T o t a l	Mean	4.52	4.38	4.26
	N	50	50	50
	Std. Deviation	.505	.490	.600

	Own level of familiarity with KMS	KMS has added to responsibilities	KMS has increased innovation in procedures	KMS significantly satisfies search for knowledge
1	Mean	3.33	3.27	3.73
	N	15	15	15
	Std. Deviation	.724	.458	.594
2	Mean	3.78	3.78	4.26
	N	23	23	23
	Std. Deviation	.518	.422	.449
3	Mean	3.17	4.00	4.58
	N	12	12	12
	Std. Deviation	.835	.000	.669
T o t a l	Mean	3.50	3.68	4.18
	N	50	50	50
	Std. Deviation	.707	.471	.629

	Own level of familiarity with KMS	KMS is user friendly	KMS is vital for company success	KMS has led to improvement in market share
1	Mean	4.33	4.53	3.20
	N	15	15	15
	Std. Deviation	.488	.516	.414
2	Mean	4.70	4.70	3.78
	N	23	23	23
	Std. Deviation	.470	.470	.422
3	Mean	4.75	4.83	3.83
	N	12	12	12
	Std. Deviation	.452	.389	.389
T o t a l	Mean	4.60	4.68	3.62
	N	50	50	50
	Std. Deviation	.495	.471	.490

C. Parameter 2: Knowledge Captured Is Accurate

19 respondents strongly agreed with the statement and 31 respondents agreed with the statement. None of the respondents disagreed with the statement. Around 62% agree that knowledge captured in the organization is accurate. The results for this question show us knowledge captured is accurate in those companies which use KMS.

A mean value of 4.27 for level 1 of familiarity is observed. The mean value reduces to 4.17 for level 2 of familiarity and is very high 4.92 for level 3 of familiarity. This implies that respondents having advanced level of familiarity strongly agree that knowledge captured is accurate.

Useful and innovative knowledge can be sourced predominantly through social interactions among employees, which is possible with the Knowledge Management System. The accessed knowledge must contribute to organizational learning, thus creating a culture that is conducive to continuous improvement.

D. Parameter 3: KMS Allows Knowledge Development

17 respondents strongly agreed, 29 respondents agreed and 4 respondents neither agreed nor disagreed. Since a major share of the respondents 92% either strongly agreed or agreed, the results show us that KMS allows knowledge development in organizations.

This parameter has a mean value of 3.93 for level 1 of familiarity. The mean value increases as level of familiarity increases. It is 4.30 for level 2 and 4.58 for level 3. This implies that respondents having high level of familiarity agree to the statement that KM allows knowledge development and respondents having low level of familiarity are not aware or are not certain.

Management support is an important factor towards knowledge contribution as reported by Al Busaidi [10].

Goswami [11] observed that respondents unanimously agreed that sharing of knowledge leads to enrichment of knowledge base.

In the software sector, if the latest knowledge is not available, the opportunity to solve problems will be lost. Teams involved in software development cannot work alone. They have to work in tandem with various sectors to derive effective solutions to the various problems. Therefore, effective knowledge sharing is very critical and this is made possible with knowledge management [12]. The experiences gained from previous projects may enable them to solve current issues satisfactorily as well as help to share best practices among colleagues [13].

Knowledge management gives employees the knowledge they need to do their jobs better. Furthermore, employees are able to acquire new knowledge if they share their knowledge with colleagues. This makes them more productive. It also gives thrust to performance and quality of work. Therefore, existing knowledge and new learning must be accessible to all. The company should encourage individual and collective learning by supporting training and development and the sharing of experiences associated with new learning and application.

E. Parameter 4: KMS Has Added to Responsibilities

Only 1 respondent strongly agreed, 28 respondents agreed, 16 respondents neither agreed nor disagreed and 5 respondents disagreed. 56% of respondents are of the opinion that the implementation of knowledge management system has added to their responsibilities. Hence, it may be assumed that, the employees are not pleased about the KMS implemented in the organization.

This parameter has a mean value of 3.33 for level 1 which increases to 3.78 for level 2 and reduces to 3.17 for level 3. This implies that respondents having high level of familiarity do not feel KM is a burden as much as the respondents having low level of familiarity. The results of this question vary according to the level of familiarity and experience of the respondent.

Efficient knowledge management requires a carefully designed process, and resources to monitor and maintain it. It requires that the success of transactions be measured not only by the end product, but by the quality of information management in the process of making it. Thus, this may contribute to increase in responsibilities of concerned staff.

F. Parameter 5: KMS Has Increased Innovation in Procedures

34 respondents agreed and 16 neither agreed nor disagreed. None of the respondents either strongly agreed with the statement or disagreed. 68% claim that knowledge management has allowed for innovation in procedures being followed in the organizations.

This parameter helps determine the extent of KMS being used as well as the success of the KMS

A mean value of 3.27 is observed for level 1 of familiarity which increases to 3.78 for level 2 and 4.0 for level 3. This implies that respondents having high level of familiarity agree to the statement whereas respondents having low level of familiarity are uncertain about how KMS can lead to innovation in procedures in the jobs of employees.

As ideas can be shared easily, knowledge management may increase innovation. According to Liu [14], the main benefit of knowledge utilization for individuals is individual learning, which is indicated by an individual's productivity, i.e., decision making and innovation. Having a diverse knowledge base within the firm can facilitate innovation through novel combinations of readily accessible pieces of knowledge.

Acquired knowledge, therefore, needs to be acted upon in innovative areas, which will then impact on financial output.

G. Parameter 6: KMS Significantly Satisfies Search for Knowledge

15 strongly agreed with the statement, 29 agreed and 6 neither agreed nor disagreed. 88% of the respondents believe that the company's knowledge management system satisfies individuals' search for knowledge.

This parameter has a mean value of 3.73 for level 1 which increases to 4.26 for level 2 and 4.58 for level 3. This implies that higher the familiarity higher number of respondents agree with the statement. This would also indicate that if the employees are satisfied with the efficiency and effectiveness of the system, they will be willing to use the system.

Firms need to develop and renew their knowledge continually to prevent their knowledge from becoming obsolete due to continuous up gradation. Searching for and acquiring new sources of information and new technologies helps organizations to stand out in gaining market share in terms of their products and services.

This can only be possible if the KMS ensures that the employees have information at the time they need it. It should utilize search engine tools that can support company goals by giving considerable insight into knowledge required by staff. It should also promote knowledge sharing across boundaries. Regular monitoring of the search tools is also required to track changing priorities and needs of staff [15].

H. Parameter 7: KMS Is User Friendly

30 respondents strongly agree and 20 respondents agree to the statement. Hence, 60% claim that the knowledge management system is user friendly.

Here a mean value of 4.33 was observed for level 1 which increases to 4.7 for level 2 and 4.75 for level 3. These values imply that almost all the respondents agree to the statement that KMS of their company is user friendly.

As the level of familiarity increases respondents find it easier to use, which is a natural concept with any software. Chandran D and Raman K [16] in a study in Malaysian business firms noted that 60% of the employees face difficulties in accessing relevant knowledge due to lack of skills in using various technologies and tools. The good response obtained in the present study may be due to the study having been carried out in a highly skilled environment such as software companies.

I. Parameter 8: KMS Has Led to Improvement in Market Share

31 respondents agreed with the statement and 19 respondents neither agreed nor disagreed. None of the respondents either strongly agreed or disagreed. 62% claim

there has been improvement in the market share following implementation of knowledge management system where as 38% is not certain.

It can be inferred that a considerable percentage of the respondents are not aware of the impact of KMS on market.

A mean value of 3.20 for level 1 is observed, which increases to 3.78 for level 2 and 3.83 for level 3. The total mean value for this parameter is the lowest among all the parameters.

These results are similar to a study on ICICI bank knowledge management initiatives by Goswami [11] where majority believed that a company's knowledge base would yield dividends but were not sure about every employee's contribution to profitability of the company. According to Kautz [17] in a survey of global consulting company, the large majority (89%) of the system users believe that the IT supported KMS provides the company with a competitive advantage.

Organizations can create new ideas and improved services with the help of knowledge management. Analysis of existing knowledge will help understand the basis for competitive advantage of other firms. This will help them tailor products and services to market needs and increase profitability [18]. The customers would also like to receive knowledge and expertise on how to use the product in the most efficient manner. This will help them to get an edge in the market share.

J. Parameter 9: KMS Is Vital for Company's Success

34 respondents strongly agreed with the statement and 16 agreed with it. None of the respondents disagreed with the statement. 68% of respondents feel that knowledge management is vital for their company's success.

Level 1 has a mean value of 4.53 which increases to 4.70 for level 2 and 4.83 for level 3.

Senior level employees believe that the success of the company has been reflected through its KMS which is indicated by the higher mean values found in this group.

Having access to accurate, current, critical information is crucial to business success in today's world. The more the employees in the organization are involved in the knowledge sharing process, the better the individual as well as overall performance. Improved performance will thus lead to enhanced service delivery [19]. Further, by incorporating a KMS, the company can move forward even as people leave, as the processes are well defined, easy to find and implement as well as train new employees to carry on with the work assigned. It is also an effective means to retain the intellectual property of an organization.

V. SUMMARY

The power of knowledge is a valuable strategic resource in the knowledge economy. Knowledge management has therefore become widely recognized as essential for the success or failure of organizations. Hence, an increasing number of organizations are integrating knowledge management into their business practices. The present study was designed to evaluate the state of knowledge management implementation in two software organizations and assess the awareness levels of knowledge management

as well as degree of acceptance in these organizations.

The results for the parameters have shown that as the level of familiarity increases the mean value also increases. Since most of the parameters bring out the assumed benefits of KM for the organization, the more number of respondents agreeing with the statement that the KMS implemented is effective and is being utilized optimally.

Knowledge that was shared in the organizations was opined to be of high quality, readily applicable and accurate. It was also well structured and updated regularly. Most respondents feel that KMS significantly satisfies their search for knowledge and is user friendly and almost all respondents feel that KMS is vital for their company's success.

However, organizations have to address certain areas regarding the implemented knowledge management system. A considerable number of employees are not familiar with the KMS and use it mainly to search for general information and not to participate in competence networks to develop shared knowledge assets. They feel KMS has added to their responsibilities at the workplace and they do not perceive the benefits of KMS in terms of improved innovation and market shares.

Better information and more training about the KMS framework and its IT support will possibly enhance the effectiveness of its implementation. Adequate resources should also be provided for the functioning of KMS in the organizations.

In the present study, the respondents belonged to different strata in the organization. It is recommended that, in future studies, respondents have similar positions and sufficient tenure of work at the organization to ensure that respondents have sufficient knowledge of the issues of the study.

The findings of this study may not be strongly generalizable due to small sample size. Further case studies in different industry sectors should be undertaken to strengthen the results.

VI. CONCLUSION

Implementing knowledge management appears challenging because of the resources, time and effort required before the benefits of the KMS become obvious. The fast changing pace of technology is another deterrent. However, it is evident that software companies still depend on knowledge retained within the company and that the knowledge management system will certainly contribute towards expansion of company objectives and achieving targets.

The following observations may be made from the present study.

52% of respondents agree that a high quality of knowledge exists in the organization.

Around 62% agree that knowledge captured in the organization is accurate.

58% agree that the organization allows knowledge development.

56% of respondents are of the opinion that the implementation of knowledge management system has added to their responsibilities.

68% claim that knowledge management has allowed for

innovation in procedures being followed in the organizations.

58% believe that the company's knowledge management system satisfies individuals' search for knowledge.

60% claim that the knowledge management system is user friendly.

62% claim there has been improvement in the market share following implementation of knowledge management system.

68% of respondents feel that knowledge management is vital for their company's success.

Though the two companies included in the study cannot be regarded as representative of all software organizations, it is clear that a strong awareness exists of the importance of knowledge management in these organizations. The results of our study indicated a significant relationship among the 9 constructs of the questionnaire related to knowledge management. The present research contributes partially to the issues of determining and evaluating knowledge management success.

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