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HOW TO IMPROVE THE KNOWLEDGE MANAGEMENT PROCESS IN SOFTWARE COMPANIES FOR EMPLOYEE SKILL DEVELOPMENT?

[1]Arunima K. V, [2]Dr. P. Pakkeerappa

[1]Research Scholar (Full-time), Dept. of Business Administration,Mangalore University, Mangalagangothri, Mangalore, Karnataka, India

[2]Retd. Professor & Guide, Dept. of Business Administration, Mangalore University, Mangalagangothri, Mangalore, Karnataka, India,

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Abstract

Many leading software companies claim to be highly knowledge centric with very effective Knowledge Management (KM) system designed to capture knowledge assets strategically. But the real application of knowledge happens at the employee level where the software professionals of the organizations fundamentally use and apply knowledge at the project level in the developmental phases. This qualitative study tries to identify the limitations of existing KM process in the software companies and explore how the KM process can be improved for skill development from the perspective of software professionals. The data was collected through 20 unstructured interviews with software professionals from different multinational software companies. The transcripts were thematically analysed and the results shows that though KM has been implemented in software industry for past two decades, there still exist certain issues pertaining to knowledge creation, storage, sharing and application. The study suggests few solutions such as strategic planning on training, innovative team management techniques, mentoring for employee up-skilling, Motivation for better documentation, segregation of knowledge sharing tools, building a positive knowledge sharing culture and project innovations.

Key words: Knowledge management, Software companies, Skill development, Qualitative analysis.

1. Introduction

From times immemorial, human knowledge had been the key source of all innovations. But Knowledge Management (KM) as a managerial tool for organisational performance had been exclusively researched from early 1990s and it has become a buzz word in the corporate world for past decades. Software industry was one of the early adopters of KM as an organisational tool for business excellence and competitive advantage. In the early 2000s majority of the researches focussed on the design and implementation of KM system in software companies and its impact on organisational performance. Huge investments were done on this area focusing on the enablers of KM such as technological infrastructure, and KM process such as creation, storage, transfer and application of knowledge in organisations. This trend is being continued even in the present scenario of software industry, even though the industry witnessed various structural, technical and managerial changes. It has been observed from the previous researches on KM in software industries that majority of them focussed on the organisational perspective and less importance was given on the employee perspective.

Research Gap and Research Problem

As software professionals are the key knowledge workers, their perception on the KM practices are relevant in terms of its effective utilization for skill development. From an employee perspective, the immediate outcome of KM would the employee skill development which in turn results in their better productivity. Therefore it is important to analyse the existing KM process in the software companies from the software professional's viewpoint, so that they can be improved for skill development. Skill development is often discussed only in relation to the recruitment objectives of software companies where it has to be imparted in the professional education curriculum to suit the requirement of manpower on software companies. But the skill development for career growth is equally important. The KM process basically includes Knowledge Creation, Knowledge Storage, Knowledge Transfer and Knowledge Application. This study tries to explore the limitations of the existing KM process and how this can be improved for developing the skills of software professionals. This is done through unstructured interviews with software professionals of leading multinational software companies.

Theoretical Foundations

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Davenport and Grover (2001) defined KM as the process of capturing, distributing, and effectively using knowledge. Nonaka (1994) popularized the concept of "tacit" knowledge which is defined as subjective insights and intuitions carried in the human minds and are difficult to capture and share. Therefore knowledge creation is a nonstop process of personal and organizational self-renewal that has the potential to re-create and improve organizational knowledge assets through people, processes and practices. It needs to set broad priorities and integrate the goals of managing intellectual capital and the corresponding effective knowledge processes (EKPs), which requires systematic KM(Wiig, 1997). Gartner Group (1998) provided a more comprehensive definition where KM was defined as an integrated approach to identifying, capturing, evaluating, retrieving, and sharing all of an enterprise's information assets. These assets may include policies, procedures, documents, and previously un-captured expertise and experience in individual workers. The top executives of organizations find that the vendors of most of the knowledge management software tools claim them as KMS, but these technologies are well suited to creating, processing and managing particular knowledge assets, rarely meet the need of unifying all of an organization's knowledge (Offsey, 1997).Bhatt(2001) says that the interaction between technology, techniques, and people allow an organization to manage its knowledge effectively. Alavi and Leinder(2001) concluded that Knowledge management involves distinct but interdependent processes of knowledge creation, knowledge storage and retrieval, knowledge transfer, and knowledge application. In a business environment, an organization and its members can be involved in multiple knowledge management process chains and the complexity, resource requirements, and underlying tools and approaches of knowledge management processes vary based on the type, scope, and characteristics of knowledge management processes. Knowledge is the actuality of skillful action (we recognize that someone has knowledge through their performance of a task) and/or the potentiality of defining a situation so as to permit (skillful) action (Stehr 1992).

Among the KM process, Nonaka(1994) defined knowledge creation based on four patterns of interaction involving tacit and explicit knowledge namely, socialization, externalisation, combination and internalisation(SECI Model). Most importantly the organizational benefits of consistent and frequent knowledge creation process participation increase over time as the match of skills and task complexities improve (Chen and Edginston, 2005). Bukowitz (1998) said that another reason that organizations focus so intensively on technology platforms when they build knowledge bases is that many secretly harbour a hope that if they can figure out how to build the perfect knowledge base, one that is seamlessly integrated into the flow of everyday work, then contribution will become virtually effortless. Berten and Ermine (2006) says that the knowledge economy is complex and dealing with complexity becomes easier by putting knowledge available with the information system support for the interactive information flows instead of keeping it out of reach of a majority of knowledge workers, which can result in better knowledge application.

Now focussing on software industry, Metiu and Kogut(2004) say that firms have acquired a body of skills to manage intellectual work across distance and national boundaries. Knowledge management implementations are high in software companies compared to other industries (Chawla and Joshi, 2010) as the industry is knowledge centric and also dynamic and constantly changing in technological applications.

The field of knowledge management and 'innovation has emerged strongly as the next source of competitive advantage, but the global companies are not successful in the correct implementation of KM that enable innovation (Nielson, 2006; Raj, 2007; Gibbert et al., 2008; Massingham, 2014) Besides, software and services providers give higher priority to business domain and project management skills apart from technical skills. It is suggested that for a full and rounded understanding of any type of work, it is necessary to make use of both knowledge- and skill-based concepts (Hislop, 2008; Kaiser et al., 2008).

Objectives of the study

Many leading software companies claim to be highly knowledge centric with very effective KM system designed to capture knowledge assets strategically. But the real application of knowledge happens at the employee level i.e., the software professionals of the organizations who fundamentally use and apply knowledge at the project level in the developmental phases. Hence the perception of software professionals on KM initiatives of organizations seems to be important. The major objectives of this study include:

- To identify the limitations of existing KM process in the software companies
- To explore how the KM process can be improved for skill development from the perspective of software professionals

2. Methodology

The data was collected through 20 unstructured interviews with software professionals from different multinational software companies. These software professionals, who act as the research participants in this study, were informed about the background and objectives of the study through mail. An open ended question asking for suggestions to improve KM process for skill development was communicated through mail and also telephonically. The research participants were given freedom to open up their minds either through mail or voice messages (via social media).These were later converted into transcripts for further analysis. A thematic analysis was done in three stages. In the first stage the information shared by the participants were segregated into aspects

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of Knowledge Creation, Knowledge Storage, Knowledge Transfer and Knowledge Application. Later it was further grouped as limitations of KM process followed by the suggestions for improvement. The details of the research participants are given in Table 1.

Table1.The profile of the research participants

Research Participant	Designation	Years of Experience	Name of Organisation
1	Test Analyst	7	Infosys
2	Manager	10	Cognizant Tech
3	Software Engineer	4	Mahindra
4	Software Engineer	6	Euronet worldwide
5	Technology analyst	9	Infosys
6	Associate-Projects	7	Cognizant
7	Software Release Manager	10	IBM
8	Senior Analyst	12	SAP
9	Software Analyst	11	IBM
10	Software Engineer	4	Wipro
11	Software Engineer	2	Mahindra
12	Senior Analyst	3	Accenture
13	Senior Analyst	5	Accenture
14	Software Engineer	7	Wipro
15	Software Engineer	6	Cognizant
16	Assistant Consultant	7	TCS
17	Tech Lead	5	HP
18	Tech Lead	6	HP
19	Software Engineer	2	Syntel
20	Software Engineer	4	Syntel

3. Analysis and findings

In the first stage the feedback from the research participants were segregated to four aspects, namely knowledge creation, knowledge storage, knowledge transfer and knowledge application, which constitute the different components of KM process.

Knowledge Creation

It was interesting to note that 19 participants out of 20 had seriously contributed to knowledge creation in their organisation either mentioning some limitations or suggestions to improve. The participants have seriously reported on lack of effectiveness of training sessions due to project pressure. They have also suggested for hands on technology trainings during training sessions for better knowledge creation. Besides, Khedhaouria and Jamal (2015) not only explains the critical role of team members' learning orientation in increasing knowledge sourcing, reuse and creation, but also discusses how group knowledge can be sourced with the support of knowledge repositories that are more appropriate to increase knowledge reuse. The Internet is more effective to

increase knowledge creation and knowledge reuse. It also increases knowledge creation among team members with a strong learning orientation.

The Technology Analyst at Infosys states: *Organization has set some training goals for each individual. However, these are not effectively planned and most people ignore these due to project pressures.* Manager at Cognizant Technology Solutions Ltd suggests, *More planned and dedicated training period without any project work would help to get knowledge in a systematic way.* However, *this model will have big impact on organization's revenue.*

Senior Analyst at SAP Technologies said that *Opportunities to present your team/ topic in internal/ external events provides motivation for colleagues to learn their topics in depth. Examination leaves provided encourages colleagues to learn topics of their interests which generally prove useful for the company. Fellowships (opportunities to work in other teams for a short period of time) have proved to be useful. Encouragement to take up technical/ management certifications (even outside of the organisation) has helped.*

Another serious concern with knowledge creation is the mismatch of employee interests and task allotted to them. Chen and Edginsgton (2005) say that under instances of high knowledge depreciation, however, it is unlikely that individual workers can optimize knowledge creation process decisions without organizational involvement in matching skills to task complexities. The organizational benefits of consistent and frequent knowledge creation process participation increase over time as the match of skills and task complexities improve.

Software engineer from Tech Mahindra states: *Understand the interest of the employees and allot them to projects accordingly. I have seen people who are good in coding being deployed to testing projects. Motivate them to gain knowledge on the domain and help to complete certifications. Try to clear the doubts of the one who comes to you and not to laugh at their mistakes especially freshers.*

The socialization process and the social practices in the organisation often enhance knowledge creation (Nonaka, 1995; Nonaka and Krogh (2009). The four patterns of conversion of tacit to explicit knowledge and vice versa include socialization, externalisation, combination and internalization which results from a perfect interaction between people along with technology.

Tech Lead from Hewlett Packard says that *Mentoring/ Coaching by senior colleagues provides a formal framework for up-skilling of juniors has proved more effective than informal/ on the job mentoring by seniors.*

Having an assigned buddy while joining the company helps newcomers to ramp up faster on organizational policies, says software analyst of Accenture.

Knowledge Storage

7 participants have expressed their views on knowledge storage and they generally believe that the knowledge repository in multinational software companies is good. But the problem is regarding the effective utilization of such resources. It is clear that the documentation of challenges faced in the past projects would greatly help in future projects. But often such documentation is done by the employees for the sake of appraisals due to the pressure from superiors. Participants have also suggested for portals where documents can be accessed offline.

Software Engineer at Cognizant says: Organization is having a good repository. However, these are not indexed like Google. Hence, people first go to Google for any technical solutions rather than depending on the internal sources.

Test Analyst of Infosys reported: *We upload documents mainly due to pressures during appraisals and cross reference of such documents is very rare.*

This observation is in line with several counter intuitive findings that suggest that there is not very much learning going on technical support knowledge repositories (Gray and Durcikova, 2005).It was observed that most of KM initiatives in organizations fail due to the reluctance of employees to document knowledge through these systems. Kankanhalli et al., (2005) in their model employs social exchange theory to identify cost and benefit factors affecting knowledge usage, and social capital theory to account for the moderating influence of contextual factors.

Knowledge Sharing

Out of 20, 9 participants explained about the knowledge transfer/sharing in their organisation. They agree that sufficient applications/tools of knowledge transfer are available in their organisation but not explored to full extent. A software analyst at Accenture says *There are sufficient applications/tools available for knowledge sharing, but often some of them are not comfortable when we work under pressure. It would be better if the screenshots of modules could be shared for better understanding. Such issues would be different for different organisation.*

Senior Analyst at SAP Technologies reminded*: In most organisations, employees are forced to compete with each other for rewards and recognition leading to lesser overall cooperation and collaboration resulting in restricted knowledge sharing*

Software Engineer at Syntel suggested that a specific Knowledge Transfer on a particular project can be provided by seniors and team members. Tech Lead at Hewlett Packard suggested*: If we are working on a tool the vendor organised training would provide better grip on it.*

The personal attitude and willingness to share is important in knowledge sharing and often this is found missing as mentioned by the participants. Ezey(2013) in their research shows that: "social relations and network",

physical closeness to colleagues", "no stupid question culture", "mutual exchange" "interest and work involvement", "satisfaction of helping each other", "being listened to and taken seriously", and "satisfaction from personal goal" are the different perspectives that the software development professionals have regarding the organisational factors that influence knowledge sharing. Organizational context, interpersonal and team characteristics, cultural characteristics, individual characteristics, and motivational factors enable knowledge sharing(Wang and Noe,2010).According to Chinnamaneni et al.,(2011)knowledge sharing behaviour could be either a strong positive influence of perceived enjoyment in helping others or a strong negative influence of perceived loss of knowledge power.

Knowledge Application

12 participants have contributed their suggestions to improve the knowledge application in their organisations. Senior Software Engineer at Wipro Technologies reports, *People who are working in highly technical projects with highly technical teammates will have better chances for gaining knowledge and applying it. It is not always possible to have rotation of resources very frequently to give equal chances for everyone. Can't think of any specific suggestions to address this.*

Mohamed et al., (2007) propose a systematic approach for combining the principles of Knowledge Management and Cross functional teaming that enhance knowledge flows throughout the organizations catering to significant improvement in organizational performance in terms of cost, time and quality.

The software engineers at Syntel and Euronet Worldwide also mention that the scope of knowledge application varies greatly with the kind of projects you are involved.

Software Release Manager at IBM suggests that

Organization should have dedicated funding to promote innovations from employee which can be beneficial for business

Senior Analyst at SAP contributed an interesting aspect:

I can give an example of my company encouraging knowledge application by providing opportunities to work in Corporate Social Responsibility projects. There is also a pool of projects available for employees to contribute to if they can spare some time and interest outside of their regular work.

Although the existing literatures focuses mainly on restructuring the organization that support knowledge application, the suggestion of generating innovative projects indeed is novel and could be encouraged. The opinion of

	Limitations	Suggestions for Improvement
Knowledge Creation	Lack of planned training sessions, Increased work pressure of employees restrict creation of knowledge, Mismatch in the skill set of employees and tasks allotted to them , Lack of knowledge support for fresher.	Planned training period for employees without project work, Better team management by giving opportunities for team to present their research and fellowships for employees to work in diverse teams, Mentoring/ Coaching by Seniors for up – skilling juniors.
Knowledge Storage	Poor utilisation of knowledge repositories, Lack of effective documentation efforts from employees	Improve the offline access of repositories, motivate the employees for proper documentation by linking to appraisal
Knowledge Transfer	Overload of information sharing tools, employees are forced to compete which result in restricted sharing of knowledge	A better clarity on usage of knowledge sharing application/tools on its appropriateness need to be imparted, Develop a positive knowledge culture where knowledge sharing would be encouraged(such as rewards on knowledge contributions)
Knowledge Application	Scope of knowledge application purely depends on the scope of projects.	Provide a pool of projects for employees to contribute to if they can spare some time and interest outside of their regular work

Table 2: The KM variables that can improve and limit the employee skill development

research participants can be generalized in terms of the limitations and suggestions. This is explained in Table 2.

Implications of the study and the conceptual model

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The study tries to qualitatively explore the limitations of existing knowledge process in software companies and also suggestions to improve them for employee skill development. Although KM has been implemented in software industry for past two decades, there still exist certain issues pertaining to knowledge creation, storage, sharing and application. Past researches focused on the impact of KM on organisational performance, competitive advantage and innovation. The impact of KM on innovation is under research as the scope of KM from various perspectives such as knowledge, resources and processes are significant in developing creativity and innovation. But the role of KM in employee skill development is under researched. The real application of knowledge happens at the employee level where the software professionals of the organizations fundamentally use and apply knowledge at the project level in the developmental phases. From an employee perspective, the KM initiatives should result in an effective enhancement of employee skills to perform his job. Therefore the impact of KM processes in a software organization on the employee skill development is definitely a serious concern and is a very important research gap as the studies relating to KM and employee skill development are few or rather less focused. Based on the

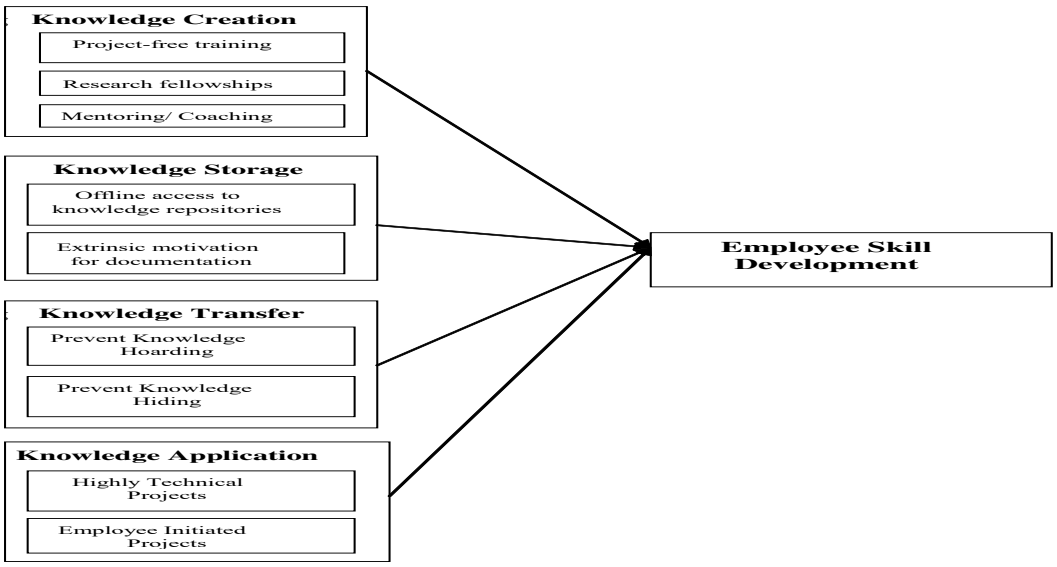

Figure 1: KM – Skill Development Model in Software Industry

variables suggested by the research participants a conceptual model is derived as explained in figure 1.

The study suggest a few solutions such as operational planning on training, innovative team management techniques, mentoring for employee up-skilling, Motivation for better documentation, segregation of knowledge sharing tools, building a positive knowledge sharing culture and project innovations. Operational planning on training mainly refers to identifying the right set training modules at right based on the skill requirements in such a way that the employees would be able to attend the sessions without any external pressures such as projects or any other work assignments. This could ensure more effectiveness of training programmes. Research fellowships sponsored by organisations for meritorious and performing employees is suggested as a great opportunity for skill enhancement. The up-skilling is possible only through mentoring of senior colleagues and coaching would be ideal to equip the beginners to new technological platforms. Though the technological infrastructure provides sufficient tools for knowledge storage often the access to these knowledge repositories are minimal. If knowledge repositories are accessible offline also, along with the online access that would motivate more employees to access them frequently. Moreover documentation can be linked to appraisal to give an extrinsic motivation. The positive knowledge sharing includes concerns of knowledge hoarding and knowledge hiding. Knowledge hoarding happens when multiples applications/tools are available for knowledge sharing resulting in information overload. This problem varies from organisation to organisation and clarity on the usage of such applications has to be communicated to employees. Another issue is the tendency of employees to hide knowledge due to internal competitiveness which adversely affects the positive knowledge culture, which would adversely affect the organisational performance in long run. Skill development occurs only from open minds and therefore knowledge hiding is a serious problem. The feedback about skill development from knowledge application in software industry focused mainly on projects. The opportunity to work in highly technical projects giving more exposure being part of a technically sound team and can greatly enhance the technical skills. Moreover the support of leadership and management for employee initiated projects that have real life application and societal contributions such as CSR initiatives would not only boost the technical skills, but also enhance the leadership, managerial and societal knowledge of employees.

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4. Limitations of the study

This study is limited only to software industry and therefore some of the variables cannot be generalised. This is exploratory in nature and limits to identifying some of the areas of KM that can be refined for developing the skills of software professionals. The participants include software professionals and middle level managers only and the opinion of top management about the skill development perspectives is not considered in this study. The variables of skill development were not explored either, as it was implied that being software professionals, priority would be on technical and managerial skills. This would differ from industry to industry.

5. Conclusion

Knowledge Management in software industry had been researched for past two decades from an organisational perspective the real management of knowledge happens at the employee level ie, the software professionals of the organizations who fundamentally use and apply knowledge at the project level in the developmental phases. Hence identifying the problems and prospects of KM from a skill development perspective is a serious concern and few solutions such as operational planning on training, innovative team management techniques, mentoring for employee up-skilling, motivation for better documentation, segregation of knowledge sharing tools, building a positive knowledge sharing culture and project innovations are explored through a qualitative method. The conceptual model identified in the study promises a guideline for future empirical works in this area. Moreover the study also contributes to field of employee skill development as KM can be considered as one variable of skill development in any industry.

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