Factors that enable Knowledge Management in Information Technology Organizations – a Statistical Study

***Dr. R. Krishnaveni **C.S. Senthil Raja**

Abstract

In the today's world, the markets, products, technologies, competitors, laws and even whole societies change rapidly, continuous innovation, and the knowledge and organizational learning processes which sustain such innovation, have become major sources of competitive advantage. Knowledge Management has with itself the proven concepts to feed this growing demand in creating the timely deliverables to the Information Technology industry. To explore this, we conducted an empirical study among the software developers present in the Multi-National Software Companies present across South India. Our results show that, in all the organizations there are KM efforts and it fosters the software development process. This has been realized by identifying the various factors that catalyze the knowledge management in day-to-day activities. ***Keywords:*** *Knowledge Management, KM Factors etc.,*

Introduction

Information Technology Organization concerned with implementing knowledge management in their organizations today face a lot of challenges in developing sound methods, techniques and process in this emerging area. Both the growing literature on knowledge management and the advice offered by various knowledge management consultants; however, seem to advocate forms of knowledge management practice that often appear incomplete, inconsistent, and even contradictory. This paper suggests the various factors that catalyze in identifying, practicing and managing knowledge in organizations.

In the information age knowledge is the key to competitiveness, rather than physical assets or resources. What is new about attitudes to knowledge today is the recognition of the need to harness, manage and use it like any other asset. This raises issues not only of appropriate processes and systems, but also how to account for knowledge in the balance sheet.[1]

Some organizations have proved more successful than others have, in their KM efforts, often citing their inherent culture as the central aspect behind their success[6]. Thus, the goal of this paper is to contribute to the understanding of the KM subject area, by exploring and describing various organizational factors that determine knowledge culture. This paper

*Professor, PSG Institute of Management, Coimbatore.
**Research Scholar, PSG Institute of Management, Coimbatore.senthilraja_cs@yahoo.com

commences with a discussion about knowledge hierarchy, to explore how the various hierarchies of the knowledge evaluated. The discussion and formulation of the research questions was based on a review of literature in the various factors that influences the Knowledge Management practices in the Information Technology Organizations. Second, the paper presents the research methodology and design adopted for this study to address the specified research questions. Third, the findings of this study are analyzed, discussed and evaluated with the insights gained from the existing KM literature. The concluding section of the paper presents the implications of the findings of this study on KM research and practice. The section also discusses the limitations of this study and provides some directions for further research.

Challenges in Information Technology Industry

Information Technology Industry is often facing challenges in terms of frequent business requirements change, technologies obsolesce, managing knowledge worker and global competitions. Hence there exist definite needs for these organizations to adopt a strong process control into place through which these requirements can be met. Most organizations have linked and reacted to the wave of knowledge management and thus have enforced various Knowledge Management practices into each of their process models. Almost all of the organizations have adopted Knowledge Management practices into their profession to yield much benefit when compared to their earlier blacked out days. There are multiple factors that are dependent to have successful Knowledge Management strategies across the organization. These factors need to be adopted in the right manner to achieve good result in the Knowledge Management practices.

The balance between knowledge and other resources of production in IT Industry has shifted so far towards the former that knowledge has become perhaps the most important factor determining the glue in process improvements. The growing demand for knowledge-based products and services is changing the structure of global economy; thus the role of knowledge is becoming an important management issue all over. As a result, many IT organizations are exploring the field of knowledge management and the various factors of it to achieve and sustain the global competitive advantage.

Objective of the Paper

To empirically validate the various factors that influences the Knowledge Management in the Information technology industry.

Research Methodology

To test this hypothesis and to study if knowledge management is practiced as a process in Information technology Industry, a statistical study is being carried out among the software developers.

A structured questionnaire having 108 questions, was framed to collect responses. These questions were framed on a five-point Likert scale. The organizations were carefully selected from the major south Indian IT hub cities: Chennai, Bangalore. A total of 540 questionnaires were mailed to different IT persons. Out of the 540 questionnaires, 15 questionnaires were returned undelivered and 20 responses were found to be incomplete and therefore not considered for analysis. Only 302 questionnaires were to be found usable.

Aspects covered in the questionnaire

The focus of present research was to study the various factors of the Knowledge Management practices in Indian IT industries, which are typically software industries such as Software Development, BPO, and IT Enabled Services etc. The scope of the present research is generally not beyond these Indian IT industries though the research implications may have some bearing on other sectors too. Some of the unexplored sectors are important from the KM point of view but are beyond the scope of the present study. This is mainly due to time constraint involved in undertaking the whole set of sectors operating in India.

Aspects covered in questionnaire included the life cycle of KM and the various factors that influence it. To be in detail, the various life cycle factors like Knowledge Acquiring, Knowledge Organizing, Knowledge Store, Knowledge Access, Knowledge Apply, Knowledge Share and Knowledge Creation. The factors of the KM that are considered are Leadership, Culture, People and IT Infrastructure. Questions are mainly focused on these areas.

The data was collected in the form of questionnaire in direct interaction with the employees. Also data was collected in the web site and via the email.

Knowledge Hierarchy

Knowledge → "Information with value, from the human mind"

- Tom Davenport

The majority of academics and knowledge management authorities make a distinction between the three related but discrete terms of data, information, and knowledge. The three terms are hierarchical in nature with data being the foundation upon which information builds to a cliff of knowledge.

Today, several cognitive theories exist that take into account the pyramid of data, information, and knowledge. Some research suggests the hierarchy should extend beyond these three basic building blocks. For example, the US Department of Defense (1996) suggests the hierarchy should include a fourth component – understanding. Systems theorist and Professor of Organizational Change Russell Ackoff's hierarchy extends the Defense's pyramid to five by adding wisdom (Allee, 1997).[2]

Data, information, and knowledge can be considered, not as discrete entities, but as existing along a continuum, as illustrated in Figure 1. They exhibit a relationship with their context and the amount of understanding they either impart or require.

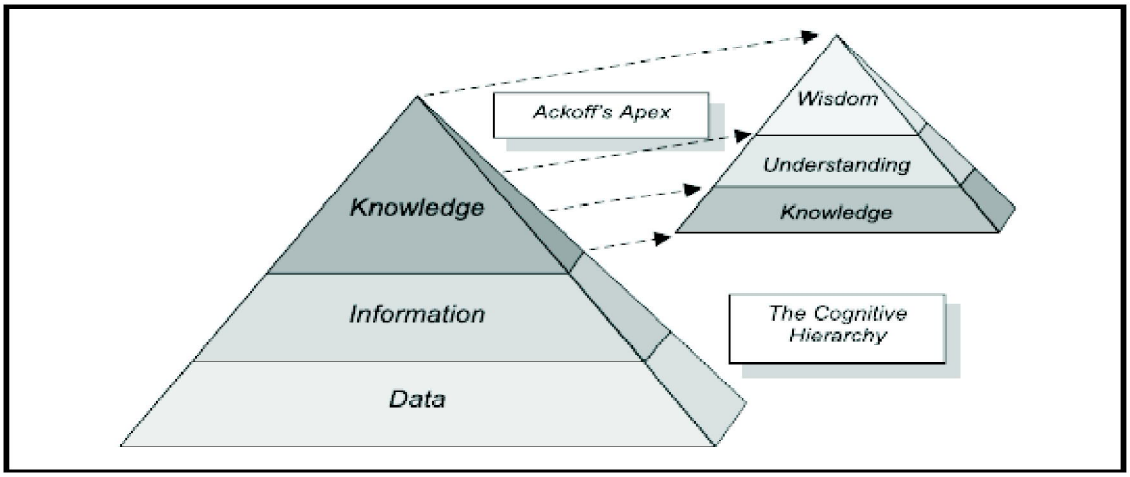

Figure 1: The Knowledge Hierarchy Based on the cognitive theories of Davenport and Prusak (1998) and Ackoff

Data: Davenport and Prusak (1998) define data "as a set of discrete, objective facts about events" and they suggest, "in an organizational context, data is most usefully described as structured records of transactions". The data in itself lacks inherent meaning and provides no sustainable basis for action.

Information: Davenport and Prusak describe information as "a message, usually in the form of a document or an audible or visible communication". Fundamental to their definition is the underlying assumption that a message must have a sender and a receiver. Davenport and Prusak suggest that "information is meant to change the way the receiver perceives something, to have an impact on his judgment and behavior". This supports Drucker's[4] claim that "Information is data endowed with relevance and purpose" (p. 5). Combining these premises, one may deduce that the recipient, not the sender, is the real judge as to whether the packet received is data or information. In other words, even if a sender believes that information is being sent, the receiver may judge the package to be data if it does not have an impact on his or her perception, judgment or behavior.

There are five major ways to transform data into information. First, one may put the data into context by communicating the reason for gathering the data. Second, one may categorize the data by describing the breakdown or the essential components of the data. Third, one may mathematically or statistically calculate the data. Fourth, one may correct errors in previously reported data. Finally, one may condense the data by providing a summary instead

of the entire collection of data (Davenport and Prusak, 1998). In the above 5 methods of transforming into information Context transformation only requires human intervention where as the rest of them can be interpreted with the help of even computer and the various information systems.

Knowledge: Knowledge is a shared collection of principles, facts, skills, and rule[5]. More specifically, organizational knowledge aids decision-making, behavior and actions, and is primarily developed from the knowledge of individuals within the organization. Firms strive to generate superior knowledge that, if appropriately managed, results in superior performance. Thus, knowledge is, arguably, the single most important source of core competence[3].

Davenport and Prusak (1998) defines the knowledge as follows:

"Knowledge is a fluid mix of framed experience, values, contextual information, expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms."

As like the data is transformed to information, information is transformed to knowledge through a set of activities that increases its value. There are four such activities that transform information into the knowledge. First, one may Compare information with previous information, primarily to determine what has changed in a particular situation. Second, one may determine the Consequences or Repercussions of this information on decisions. Third, one may consider how this information Connects or Correlates to other information. Finally, through Conversation one may conclude what people think about the information (Davenport and Prusak, 1998).

A very interesting point here to note is that unlike information interpretation (can happen mainly with technological solutions), Knowledge transformation can happen mainly with the human intervention. Though the computers support the transformation, the key transformation can happen with the human solutions only.

Types of Knowledge and its transformations

Ikujiro Nonaka believes there are two types of Knowledge: explicit or implicit.

Explicit Knowledge: This is tangible, being clearly stated and consisting of details which can be recorded and stored. This knowledge may be recorded in the form of documents, pictures, graphs etc.,

Tacit Knowledge: Implicit or tacit knowledge is often unstated, based on individual experience and therefore difficult to record and store (Demarest, 1997).

Tacit knowledge is highly personal and hard to formalize, making it difficult to communicate and to share with others. Subjective insights, intuitions and hunches all fall into this category of knowledge. Furthermore, tacit knowledge is deeply rooted in an individual's action and experience, as well as in the ideals, values, or emotions he or she embraces (Nonaka and Takeuchi, 1995, p. 8).

The transformation of the explicit and tacit knowledge is given in the form of spiral in Figure 2.

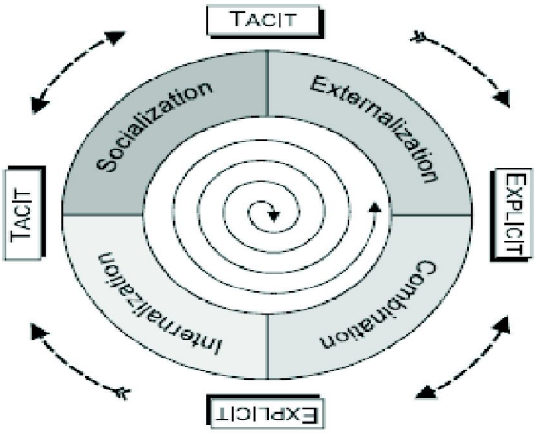

Figure 2: Knowledge Transformation spiral based on (Nonaka and Takeuchi, 1995)

Tacit to Tacit (Socialization): Socialization involves the transmission of tacit knowledge between individuals as when a new employee learns through observing and working with a skilled worker (e.g., on-the-job training or apprenticeship systems).

Explicit to Explicit (Combination): Combination involves the transmission of explicit knowledge between individuals and is perhaps best illustrated by the activities that constitute formal education (i.e., teaching a class). Equally common is the creation of new knowledge by combining previously documented explicit knowledge.

Tacit to Explicit (Externalization): In this case, people strive to create or transfer tacit knowledge to the explicit form. One would wish to articulate or externalize the highly personal knowledge of the master artisan into an explicit form that is easier to formalize or document. The use of metaphor and analogy constitute articulation.

Explicit to Tacit (Internalization): Internalization is represented by the conversion of explicit knowledge to tacit knowledge. Professions that involving diagnosis and trouble-shooting (e.g., mechanics, medicine, repair) are based on internalization whereby the individual

learns the formal knowledge so well it becomes "second nature". As a result, skilled workers in these areas will often know the answer to a problem without being able to reproduce their decision-making steps.

Nonaka (1991a) also suggest that articulation and internalization are the most important forms of knowledge creation because they result in an increase in the organization's store of knowledge.

Invariably, both forms of knowledge begin as individual knowledge but, to substantially improve performance, are transformed into organizational knowledge, an often difficult feat in the case of implicit knowledge as shown in the Figure 3. Thus, it is the role of knowledge management to ensure that individual learning becomes organizational learning.

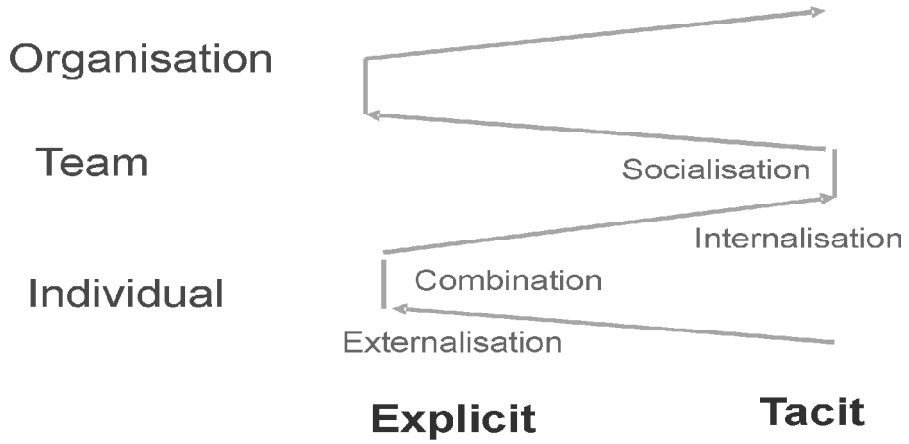

Figure 3: From Individual knowledge to Organizational Knowledge

Knowledge Management

Knowledge Management includes all the ways in which an organization's knowledge assets are handled, including how knowledge is gathered, stored, transmitted, applied, updated, or generated. The Knowledge Management life cycle that we considered for our study was Acquiring, Organizing, Store, Access, Apply, Share and Create.

Knowledge Management Factors

From the literature study, the various knowledge factors that are considered for this research study are listed below in the Table 1. These factors are the various facts that affect the knowledge management practices within the IT Organizations. These micro factors can be grouped together under the four broad categories as shown in the Figure 4.

Table 1: KM Factors considered in the study		
Best practices repositories	Group motivations	Online chat / Instant
Change management	Groupware - Workflow &	messaging
Collaboration	Tracking systems	Openness to change
Communities of	Human resource management	Professional development
practice/purpose	Incentives	Recognition
Continuous Improvement	Individual motivations	Reward systems
Corporate Intranet -Extranet	Knowledge Portal	Risk taking
- Internet	Knowledge Sharing	Search engines
Corporate Yellow pages -	Knowledge work	Senior management
Directory of expertise	Knowledge worker	Sponsorship
Expertise locator	Lay-offs	Technical Expertise
Difficulties in KM	Leadership	Teleconferencing and
Document/Content	Learning	Videoconferencing
Management Systems	Lessons learned	Web-based Training /
Flexibility		E-Learning

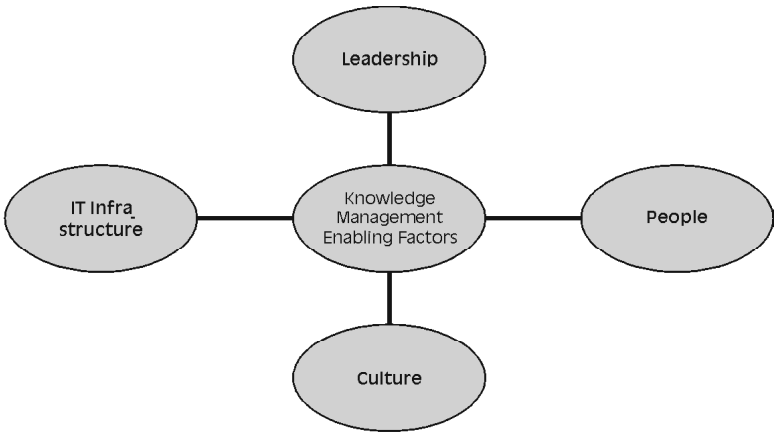

Figure 4: Knowledge Management Enabling Factors

Leadership

Leadership drives the Knowledge Management activities in the Information Technology Organizations. Top Management should know the importance of KM and its value addition to the business. KM activities begin to cross lines of business; it is difficult for business leaders to agree on what to do and to design effective knowledge projects. As KM becomes more and more enterprise-focused, it is therefore likely there will be a need for a strong, centralized KM function. While some "micro-KM" activities will likely continue in the lines of business, especially in those organizations that are strongly decentralized, obvious cross functional synergies and the need for KM leadership at the executive level will drive KM into a largely centralized structure over the next few years. The factors that influences the KM from the leadership perspective is shown in the Figure 5.

The knowledge managers expressed a strong desire for even more visible executive support and leadership for KM in the future. This will likely lead to more structured KM governance with processes for making difficult cross-functional decisions, establishing priorities and better integrating KM planning with IT and HR plans. Furthermore, knowledge managers will probably make greater use of advisory committees to help them set policies and standards and assess risks in different areas[9].

Figure 5: Knowledge Management Enabling Factors - Leadership

The knowledge manager should bind for continuous changes. He has to continuously look for the improvement of the project during every release. The manager has to look for the pitfalls in the release, identify the ways of the improvement, and to implement it within the team. Hence he has to improve the team and its process activities continuously for having a robust release and better project management. The manager has to monitor whether every team member is performing their knowledge management activity as per the process agreed upon.

Knowledge managers were struggling with four cultural challenges in 1999: designing technology for people to use, building social communities, developing a knowledge-friendly managerial environment and motivating people to collaborate and share (Smith and McKeen, 2003). Developing sharing communities was seen as especially important. However, much of what was known about how to do this was purely academic. Managers knew that people should be rewarded for sharing and that sharing could be inhibited by disincentives, but in most organizations little serious work had been done beyond raising awareness about the importance of these behaviors[9].

Knowledge Management processes are being developed with the enterprise in mind. However, with some exceptions, leaders of Knowledge Management focus the applications more locally, often because it is the lines of business who provide the resources for all but the most core KM activities. Thus, Knowledge Management has a dual or mixed scope at present – enterprise for core Knowledge Management processes and local or line of business for Knowledge Management applications. For eg., based on the individual project needs, Managers develop applications within the team for code management, process flow, contact list, review applications, project relevant documents etc., Though there are some customized applications, some of the major functionalities are linked to the enterprise applications like requirements document, design document are stored in the enterprise knowledge repository application.

As more executives recognize the opportunities inherent in enterprise knowledge management, the reality will likely catch up with the vision. Increasingly, Knowledge Management applications will have an enterprise focus because organizations cannot afford not to do this. Already, they are implementing enterprise-wide information systems (e.g., ERPs) and this is giving them an appreciation for the value and synergies that can be found from cross functional applications. Information management will likely be the first Knowledge Management activity that will be truly enterprise-wide, simply because the proliferation and duplication of information across most organizations has become glaringly obvious. Managers of the projects and accounts need to concentrate for enterprise wide Knowledge Management activities.

Many interviewees expressed that, while leadership from senior management is important, it is essential that middle and front-end managers demonstrate this leadership attributes to develop and support knowledge culture throughout the organization. This study revealed that the middle and front-end managers determine the success of KM programs and development of knowledge culture in a given team or division. At some of the organizations under study, despite good support from senior management, KM programs have not succeeded in certain divisions due to the lack of support from managers at lower levels of the organizational hierarchy. Whilst in some others, a few divisional managers initiated KM programs and created knowledge

culture in their respective teams, with little support from the senior management. This study highlights the essential role of middle and front level managers in developing knowledge culture through the manifestation of various leadership characteristics. The findings correlate with the view that effective management and leadership are integral to each other and leadership at all managerial levels is required to develop a desired culture (Kluge et al., 2001; Marsh and Satyadas, 2003; Welch and Welch, 2005).

Culture / Structure

'Culture' is a term that encompasses the values, attitudes and behaviors of an organization. Organizations are communities of individuals and each enterprise has a distinct culture which describes how people relate to one another (Goffee & Jones, 1996). In other words, as one focus group member described it, "culture is how we do things around here".

Tyler (1871) was first to provide a formal description of the term "culture". He defined the term as:

. . . That complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society.

This definition emphasizes individuals, knowledge, groups and society as integral constituents of a culture.

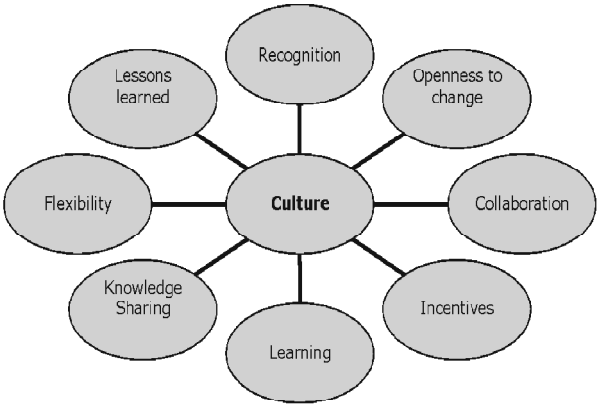

Figure 6: Knowledge Management Enabling Factors - Culture

Culture is important in organizations because it can powerfully influence human behavior and because it is extremely hard to change (Kotter, 1996). It exerts its influence in numerous invisible ways — from the kinds of people who get hired, to the types of questions and comments that are tolerated, the formal and informal expectations made of staff, the focus of reward systems, how people interact, and when they ask for help (Gupta & Govindarajan, 2000). Culture is an overarching mechanism in an organization which constrains all other

aspects of organizational life and limits what is considered desirable, possible and practical to do. Needless to say, an organization's culture will therefore affect its knowledge management initiatives and will predispose employees towards particular forms of behavior in knowledge -sharing.

The various cultural factors that catalyze the knowledge management practices are in Figure 6. Organization culture should be very flexible such that, as new paradigm arises, organization wide changes are more important. The formal team meetings will help to share the knowledge within the team. Also organization should allow for informal meetings in pantry, cafeteria and lawns that will motivate the employee to participate in knowledge sharing a better way.

During the execution of the software project which is of dynamic nature, there will be continuous change in the business requirements. Every stakeholders from business analyst to developer, not may be intentionally may end up with some human errors. Organization should be in a position to accept this. They should promote every team to participate in the session to share their lessons learned from that mistake so that the same mistake can be rectified in the subsequent projects. Some organizations are rewarding this kind of lessons learnt session.

In almost every Information Technology organizations, they are having a culture for reimbursing their certification exams based on their scoring their exams. This helps the employee for improving their technical and managerial skills under the organization to take higher roles and responsibilities. Even some of the costliest exams are fully reimbursed. From Developer to Manager everyone has their grade of certifications which are even mandatory parameter in some of the organizations during score card discussion.

Steven (1989) notes that the organizational culture is something akin to the culture of the society in which the organization operates. This view considers the organizational culture as a micro culture within the culture of a given society or nation. However, today's large organizations distributed across the world have developed their own specific cultures embedding various cultural features of the societies and nations in which they operate. These organizations continuously strive to develop their own and unique cultures with a sense of unanimity throughout their distributed divisions. Lemken et al. (2000), describe organizational culture as the sum of shared philosophies, assumptions, values, expectations, attitudes, and norms that bind the organization together. These cultural features of an organization may deviate from cultures of their respective societies. Authors take this view of uniqueness of organizational culture rather than treating it as a part of a given societal culture. This view helps us in the context of knowledge management, as many business organizations at large, influence

the cultural factors within them rather than the society as a whole. The Organization culture influences the SBU culture and the team cultures. This team culture further influences the project team members as shown in the Figure 7.

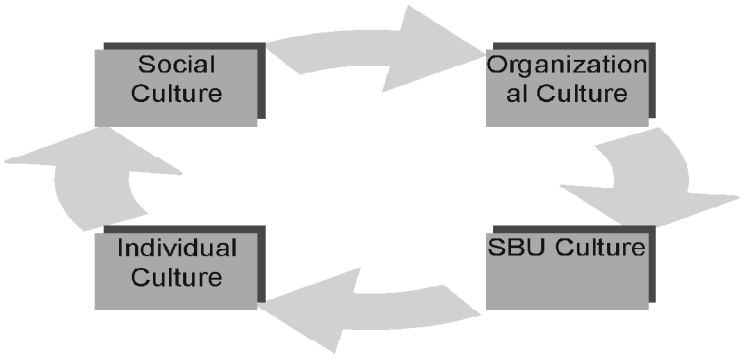

Figure 7: Culture penetration

Today, knowledge managers still agree that developing a knowledge-friendly culture is important to organizational success and this is being born out by research that links information behaviors and values closely to organizational success (Marchand et. al. 2000). However, they are a little more pragmatic about how these changes will come about. As one manager noted, "We found that announcing 'I'm from knowledge management and I'm here to change your behavior' led to a great deal of resistance!" Instead, they are finding that a better way to stimulate behavior change in the short-run is to focus on making it easy for people to use knowledge and to find what they are looking for.

As knowledge works its way into organizational life, companies will increasingly recognize the value of instilling and promoting sharing behaviors and values. It is only when this point is reached that serious efforts will be made to institutionalize a knowledge-positive culture, remove barriers to knowledge-sharing (e.g., HR practices, incentive programs) and replace them with practices that reward and encourage new ways of working. Knowledge use and sharing will also be proactively embedded into business processes so they will not require extra effort to accomplish[7].

People / Skills

The major problems in the implementation of KM project are that people do not disclose knowledge. They also feel that sharing of knowledge may have an adverse affect on their job security. Moreover, even if they are willing to share, difficulties arise as inter-department interactions are often quite insufficient, KM strategies are poor, old rules are still applied to new situations, and access to knowledge is difficult. Not only this, but a sharing platform is missing, a learning focus is missing, useful knowledge is either lost or ignored, and general sharing is discouraged. Reuse of knowledge is not

in focus. These issues are the roots of the problems in the implementation of KM. From the observations it can be reasonably concluded that a sense of insecurity is the main reason that people do not share knowledge. As one of the very premises on which the KM structure is built is knowledge sharing, this fear should be removed from the minds of individuals so that they can taste the benefits of KM[12].

People are the base success with respect to software projects. Software projects are the base for the organization. Hence organization and the manager are always in the thought of, which the project should independent of the individuals. But always the developers are in the perspective that they want to be unique across their team members and more reluctant to share the knowledge they posses. Hence managers and the top management has to remove these barriers and should insist on the benefits of the balanced knowledge across the team. The top management should always focus to remove the fear of job insecurity. This will be a great motivating people factor. Also organization should motivate all the employees for a professional development. i.e. to develop both the technical skills and the managerial skills.

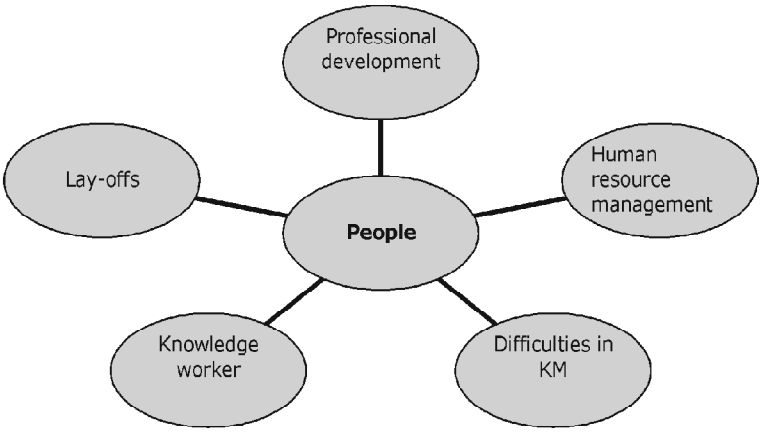

Figure 8: Knowledge Management Enabling Factors - People

The various difficulties in the Information Technology to execute the various Knowledge Management programs are to be identified by the top management and the managers and to allocate the necessary resources accordingly. The various difficulties in executing the knowledge management are listed in the Figure 9.

8.4 IT Infrastructure

Information Technology infrastructure plays a significant role in knowledge management (KM) efforts. While knowledge has always been important in organizations, it is becoming mo re manageable because of the interaction with information and communication technologies, seen to be the primary

enablers of KM[15]. Taken together, as an information technology infrastructure (IT infrastructure or ITI); they are a means for an organization to extend their knowledge resources beyond the limitations of here and now. Dan Holthouse in his foreword to Information technology for Knowledge management [4] remarked on this: "Technology is the easier piece of the problem to solve, it's far more challenging to change people's behavior and to create a learning environment that fosters the expansion of individual's personal knowledge." His assertion is based on the availability and pervasive use of IT infrastructure in organizations in the West.

In the various information technology organizations studied, the various infrastructure tools available are classified as shown in the Figure 10.

- **Best practices repository** – the various lessons learnt from the different type of projects and the best practice out of it are available here. the contents of the repository may be in the form of documents, presentations, graphs, pictures, model diagrams etc.

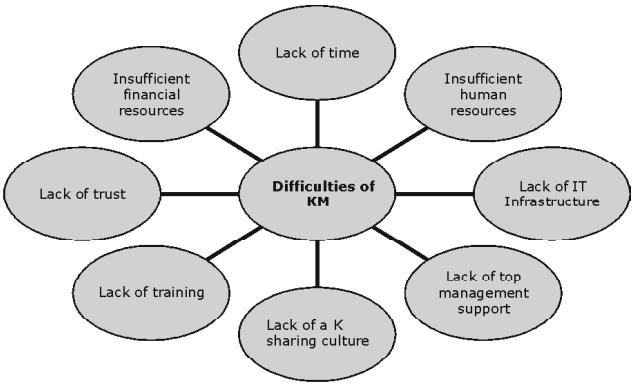

Figure 9: Difficulties of implementing KM

- **Communities of practice/purpose** – Every organization have their formal team representation as per the project. Apart from this, there may be informal communities of practices within the organization based on the technology, interests etc., This will help to improve the knowledge sharing and enriching the organizations' capability of approaching the technologies.
- **Corporate Intranet / Extranet / Internet** – Internet has become the blood of the every knowledge worker. Without that no body can excel in their work. it helps to identify the various knowledge across the world, assimilate it and use it in a customized fashion as per the project needs. Similarly every organization is having various Intranet applications that suits for their organization needs.

Extranet is nothing but the web applications that can be accessed only within the organization even then located in multiple destinations.

- **Corporate Yellow pages** – this helps to identify the various people within the organization. These intranet applications will help to locate the resource availability from the resource pool based on their profiles.
- **Expertise locator** – this application will help to locate the various expertise with various skill sets. It will help to prepare some proof of concepts while fetching for the new type of projects.
- **Online chat / Instant messaging** – the most convenient tool to share any information within the team members and also across organizations located in multiple places. These tools might have been configured across onsite and offshore team members.
- **Knowledge Portals** – Knowledge portals are very vital for organization wide information. It will be acting as the repository and the process enabler for every team members across hierarchy.
- **Groupware - Workflow & Tracking systems** – These applications are the workflow systems. The project milestone applications, leave management applications, time sheet maintenance applications are some of the examples.
- **Document / Content Management** – This is the repository for the various projects. Every organization will have their own set of processed and its relevant supporting documents. These needs to maintained in servers to share between onsite and offshore teams. The various versions of the documents like archival of it is also tracked by these applications.

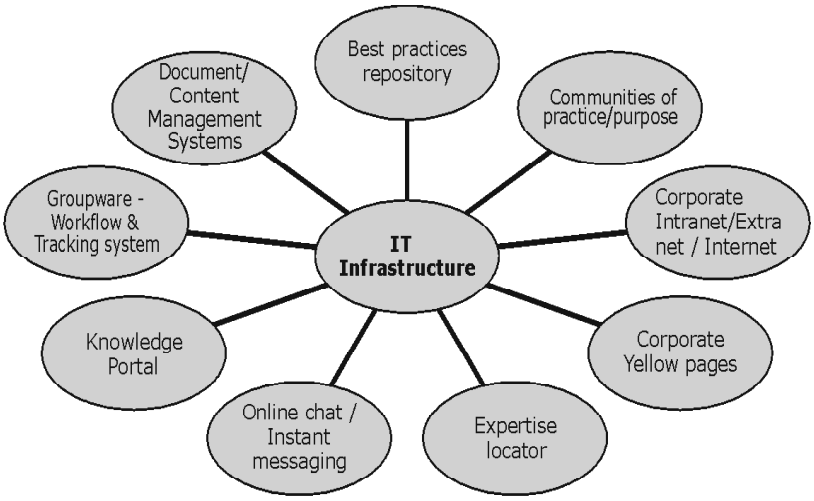

Figure 10: Knowledge Management Enabling Factors IT Infrastructure

Research Findings

The findings of the research were categorized on the factors that influence the Knowledge Management practices in the Information technology organizations. Based on the survey conducted across 25 Organizations in Chennai and Bangalore, the means of the KM enabling factors are tabulated

Table 2 Mean of the KM enabling factors

#	Orgn	Count	Leadership	Culture	People	ITTools	Overall	Benefit
1	O1	6	4.52	4.43	3.20	4.27	4.23	4.4
2	O2	9	4.00	3.89	3.47	4.04	3.64	4.01
3	O3	7	3.43	3.39	3.25	3.78	3.63	3.68
4	O4	14	3.57	3.64	3.25	3.98	3.56	3.75
5	O5	9	4.19	4.22	3.1	4.13	3.93	4.18
6	O6	4	4.18	4.39	3.31	4.36	3.81	3.92
7	O7	11	3.95	4.04	3.64	3.89	4.05	3.77
8	O8	24	3.45	3.78	3.32	3.71	3.76	3.75
9	O9	2	3.63	3.72	3.62	3.82	3.91	3.78
10	O10	13	3.94	3.99	3.6	3.61	3.83	4.09
11	O11	5	3.60	3.68	3.43	3.54	3.4	3.74
12	O12	5	3.65	3.40	3.70	3.69	3.76	3.82
13	O13	23	3.86	3.78	3.42	4.12	3.91	3.82
14	O14	8	3.88	3.64	3.59	3.82	3.59	3.95
15	O15	15	4.02	4.08	3.93	4.07	4.03	4.14
16	O16	4	3.38	3.75	2.31	3.66	3.78	4.11
17	O17	5	4.20	4.29	3.95	3.89	4.25	3.62
18	O18	5	4.25	4.14	3.90	4.58	4.06	4.4
19	O19	4	3.31	3.75	3.94	4.11	3.77	4.19
20	O20	5	4.30	3.66	3.45	3.83	3.87	3.98
21	O21	5	3.30	3.48	3.60	4.04	3.53	3.7
22	O22	10	3.25	3.59	3.28	3.31	3.46	3.82
23	O23	18	3.72	3.92	3.41	3.98	3.59	3.82
24	O24	60	3.73	3.62	3.48	3.95	3.78	3.80
25	O25	26	3.68	3.80	3.24	3.69	3.71	3.82

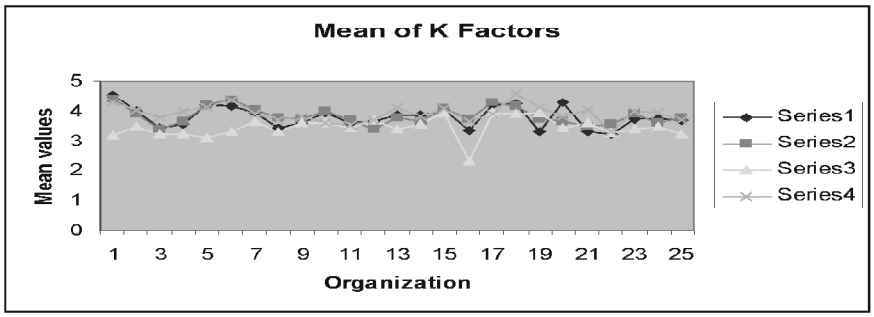

Figure 11: Graphical Representation of the mean of the KM Enabling factors.

With respect to the Leadership factor, 1st Organization is having a very good practice with the highest mean value of 4.52.

With respect to the Culture factor, 1st Organization is having a very good practice with the highest mean value of 4.43.

With respect to the People factor, 12th Organization is having a very good practice with the highest mean value of 3.70.

With respect to the IT Infrastructure factor, 18th Organization is having a very good practice with the highest mean value of 4.58.

The benefits of the Knowledge Management practices with in the organization are in the following fronts:

- Knowledge sharing - horizontally
- Knowledge sharing - vertically
- Worker efficiency and / or productivity
- Skills and knowledge of workers
- Avoiding duplication / re-invention
- Sharing best practice
- To capture knowledge from other business enterprises, industrial associations, technical literature, etc.
- Involvement of workers in the workplace activities
- Organizational memory

Further improvement in Software industry for KM process

One of the main orientation of the knowledge management in the IT industry is, it is tightly integrated with the process of software development phases. Hence the factors influence KM can be extended to the other project management activities and the team management activities. In the bigger perspective, KM can be used as a process enabler for the organizational administration activities also.

Summary and Conclusion

There is a widespread view in literature that KM plays a key role in developing Information Technology organizations. This study has explored, analyzed and presented some major factors affecting the knowledge management in information technology organizations. Based on an empirical research conducted at twenty five distributed organizations, this study has identified four key organizational elements influencing the creation and development of knowledge management. These factors include leadership, Culture, People and IT infrastructure.

Figure 3 summarizes the study findings while depicting the explored factors as a collective and presents a framework practiced in the knowledge management. The study has evidently emphasized that all these factors should be prudently managed in order to foster an effective knowledge management. The supporting illustrations and rationale, provided for each of the factors, offer some realistic strategies for the development of knowledge management.

It is very clear that every organization practicing KM has its own set of enabling factors. Based on the practices of the various factors, the organizational knowledge is preserved or transformed in the employee's knowledge, organizational products, organizational process and knowledge repository in multiple forms.

In the today's agile world, software organizations have to find their smarter ways to achieve their deliverables and target. Knowledge Management practices acts as catalyst to the knowledge oriented organizations in multi dimensional ways like time, results, efficiency and cost effectively.

The factors described in this paper are based on KM practices at the organizations with well-established KM programs. These can serve as the pragmatic guidelines for the KM practitioners and researchers. Some of the current literature in KM tends to orient towards a particular track or an organizational element, such as, the process orientation, people orientation and technology orientation. Conversely, this study demonstrates that the KM practitioners need to adopt a composite view (Table 1) of organizational factors for developing the knowledge culture.

The authors intend to further examine the following findings as the hypothetical propositions

- The expression of leadership attributes by the middle and front level managers is equally essential, as it is from the top management.
- The structure and design of the physical work environment plays a significant role in knowledge sharing attitudes of employees.
- Time allocation for employee knowledge activities, is a crucial element in developing knowledge culture and a detrimental factor for the success or failure of KM programs.
- Necessary process definition of the KM related activities to be embedded in the organizational routines and procedures.
- Recognition and Incentives acts as a good motivator for the employees contribution to the KM activities.
- Necessary infrastructure needs to be placed in the organization to participate in the KM activities from Requirements to Delivery till business support. The same should be customized from Top management to developer based on their activities.

Reference

- Moran, N. Becoming a Knowledge Based Organization, Financial Times Survey. Knowledge Management, 28 April 1999, London, UK..
- John P. Girard, Where is the knowledge we have lost in managers? JOURNAL OF KNOWLEDGE MANAGEMENT, VOL. 10, NO. 6 2006, pp. 22-38,

- Prahalad, C.K. and Hamel, G. (1990), "The core competence of the corporation", Harvard Business Review, May-June, pp. 79-91.
- Drucker, P.F. (1998), "The coming of the new organization'', Harvard Business Review on Knowledge Management, Harvard Business School Press, Boston, MA, pp. 1-19 (original work published 1988).
- Stonehouse, G.H. and Pemberton, J.D. (1999), "Learning and knowledge management in the intelligent organisation", Participation and Empowerment: An International Journal, Vol. 7 No. 5, pp. 131-44.
- Hackett, B. (2000), Beyond Knowledge Management: New Ways to Work and Learn, The Conference Board, New York, NY.
- Heather A. Smith, Dr. James D. McKeen, May, 2003, Instilling a Knowledge-Sharing Culture, Queen's University at Kingston, Ontario
- Goffee, R. and G. Jones. "What holds the modern company together?", Harvard Business Review, November-December, 1996, pp. 133-148. Goffee, R. and G. Jones. "What holds the modern company together?", Harvard Business Review, November-December, 1996, pp. 133-148.
- Heather A. Smith, Dr. James D. McKeen, May, 2003, The Evolution of the KM Function, Queen's University at Kingston, Ontario
- Kluge, J., Stein, W. and Licht, T. (2001), Knowledge Unplugged: The McKinsey & Company Global Survey on Knowledge Management, Palgrave, Basinstoke.
- Stan Oliver and Kondal Reddy Kandadi, How to develop knowledge culture in organizations? A multiple case study of large distributed organizations, Journal of Knowledge Management Vol. 10, No. 4, 2006, pp. 6-24
- M.D.Singh, Ravi Shankar, Rakesh Narain and Adish Kumar, Survey of knowledge management practices in Indian manufacturing industries, Journal of Knowledge Management, Vol. 10, No. 6, 2006, pp. 110-128
- Marchand, D., W. Kettinger, and J. Rollins. "Information orientation: people, technology and the bottom line", Sloan Management Review, Summer 2000, pp. 69 -80.
- Adekunle Okunoye, Helena Karsten, ITI as Enabler of Knowledge Management: Empirical Perspective from Research Organisations in sub-Saharan Africa, Proceedings of the 35th Hawaii International Conference on System Sciences – 2002
- American Productivity and Quality Center (APQC), Using Information Technology to Support Knowledge Management: Consortium Bench marking Study Final Report 1997
- Borghoff U. and Pareschi R (Eds.), Information Technology for Knowledge Management Springer 1998.