MAPPING TOOLS AND TECHNIQUES OF KNOWLEDGE MANAGEMENT (KM) IN LIBRARIES: A CRITICAL STUDY

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ABSTRACT

Knowledge Management (KM) is the strategic management of three components which is People, Process and Technology for overall benefits in all aspects for an organization. Among them tools and technology is one of the utmost important aspects which readily used to capture, store, manage the knowledge and used in disseminating right knowledge to the right person at the right time. Therefore, this work will explore various tools and techniques available for mapping and capturing the knowledge assets; identifying the tools and techniques of knowledge management available for practitioners and researchers, focusing on Open Source Software (OSS). This paper also point out the major challenges involved in implementing standards and policies made for KM and imperatives used in context of OSS with merits and challenges in adoption of Open Source Software's in Knowledge Management activities.

Keywords: Knowledge Management (KM), Information Management, Open Source Software (OSS), Open Source Movement, Technical and Non-Technical KM Tools, Open Source Content Management System (CMS), Digital Library, Web-Based Tools.

1. INTRODUCTION

Over the period of time information and knowledge emerges as the primary and key ingredient for strategic decisions in knowledge firms of 21st century, researchers and practitioners who can endeavor and forced to clues to gather knowledge resource, organize it effectively, and disseminate them for competitive advantages. This thrive interest on knowledge management (KM) led to a overwhelm of organizational knowledge approach in the business world (Davenport, & Prusak, 1998; and Wiig, 1997). There are many unique approaches of those initiatives for managing organizations knowledge resources using information technologies (Davenport, & Prusak, 1998; O'Leary, 1998; and Ruggles, 1998). Among these building a knowledge base using database technologies, creating knowledge repository, coming up with knowledge management system with internet technologies are few and most common inventions.

Knowledge and knowledge management both are interconnected and typical to define separately. Scholars from academics defined knowledge as advanced form of information obtained from data.

On the other hand practitioners identify Knowledge Management as simply strategic management of people, process and technology in an organization in a useful way. So major idea is KM owe to generate knowledge organized it and share knowledge valuable to the organization. Another important central idea is that KM divulges the focus from process to practice oriented. The best we seen is using communication and collaboration to improve how people do their practice and essentially defined by the need to manage knowledge in an organization like an asset. Overall story of the knowledge Management idea is that knowledge is strategic assets similar to land capital and labor so must be managed and preserved for sake of organization benefits. Knowledge is to be seen as an activity as well as an object; it is a product and a process and can be shared and reused across an organization. The following can be expressed as KM lifecycle:
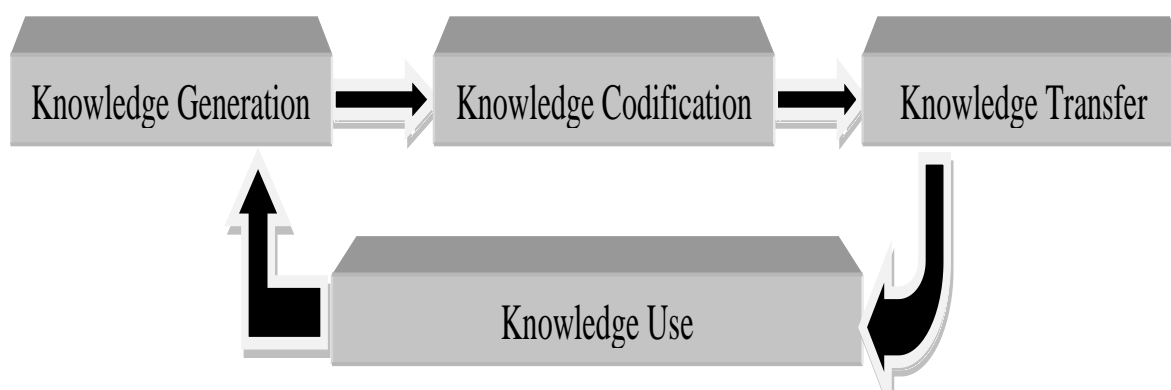
Figure 1: KM Life Cycle (Source: Ghani, 2009)

KM initiatives are often expressions of part of this process concerned with the knowledge creation, innovation or organizational learning. There are many tools exist for managing the knowledge broadly it is divided into two parts firstly the information technologies tools and secondly Web-based (IT) tools. The technologies based tools helps in form wide integration knowledge management and exhaustive sue of corporate knowledge resources while the web based tools will facilities to come up with variety of new tools for managing knowledge enabling more rich common language for representing knowledge (Nonaka, & Takeuchi, 1995; Garvin, 1993; and Romer, 1999). So before on board to a knowledge management project, organizations need to judiciously assess their available resources, culture, subsystems and hierarchy to identify the most context-sensitive knowledge management strategies for their organizations.

2. BACKGROUND: HISTORICAL PERSPECTIVE AND RESEARCH CONTEXT

Knowledge management is an emerging domain so have sort history As a witting discipline, it arises from various published an d un published work of academician, knowledge workers and scholars like Peter Drucker in 1970s, Karl-Erik Sveiby in late 1980s, and Nonaka and Takeuchi in the 1990s. It began when the concept of a "knowledge company" was introduced in published literature.

At the onset of 1980s when term 'explicit knowledge' and the introduction of KM were new, a natural evolution took place where KM described as the most beginning phase of an evolution from a managerial focus on data management than information management and finally Knowledge Management. The three main exercises appended the knowledge

management in to new horizon these are Managing information, quality of content and off course the human capital of organizations (Balmisse, Meingan, & Passerini, 2007).

Information Management came in pictures during 1970s-1980s because of emergence of Information technology (IT) where scholars found IT is just a case and platform for managing the information and act as facilitator which dealt independently of knowledge. Information technologies deal with information issues such as valuation, operational techniques, governance, and incentive schemes. "Information," had have connation of documents, data, and messages which is structured. By large, KM totally depends upon the information management's user perspective, considering the values as a function of user satisfaction than the technology orientation which have efficiency to store and disseminate the information.

Table 1: Knowledge Management Milestones

Year	Entity	Event
1980	DEC, CMU	XCON Expert System
1986	Dr. K. Wiig	Coined KM concept at UN
1989	Consulting Firms	Start internal KM projects
1991	HBR article	Nonaka and Takeuchi
1993	Dr. K. Wiig	First KM book published
1994	KM Network	First KM conference
Mid 1990s	Consulting Firms	Start offering KM services
Late 1990s	Key vertical industries	Implement KM and start seeing benefits
2000 – 2003	Academia	KM courses / programs in universities with KM texts
2003 to present	Professional and Academic Certification	KM degrees offered by educational institutional like KMCI (Knowledge Management Consortium International; information available at: http://www.kmci.org/)

(Source: Dalkir, 2005; and 2011)

In nutshell, the scope and perspective of knowledge management constantly revolved around the sharing and engagement of the system, communities and individuals which give raise to three generations of knowledge management
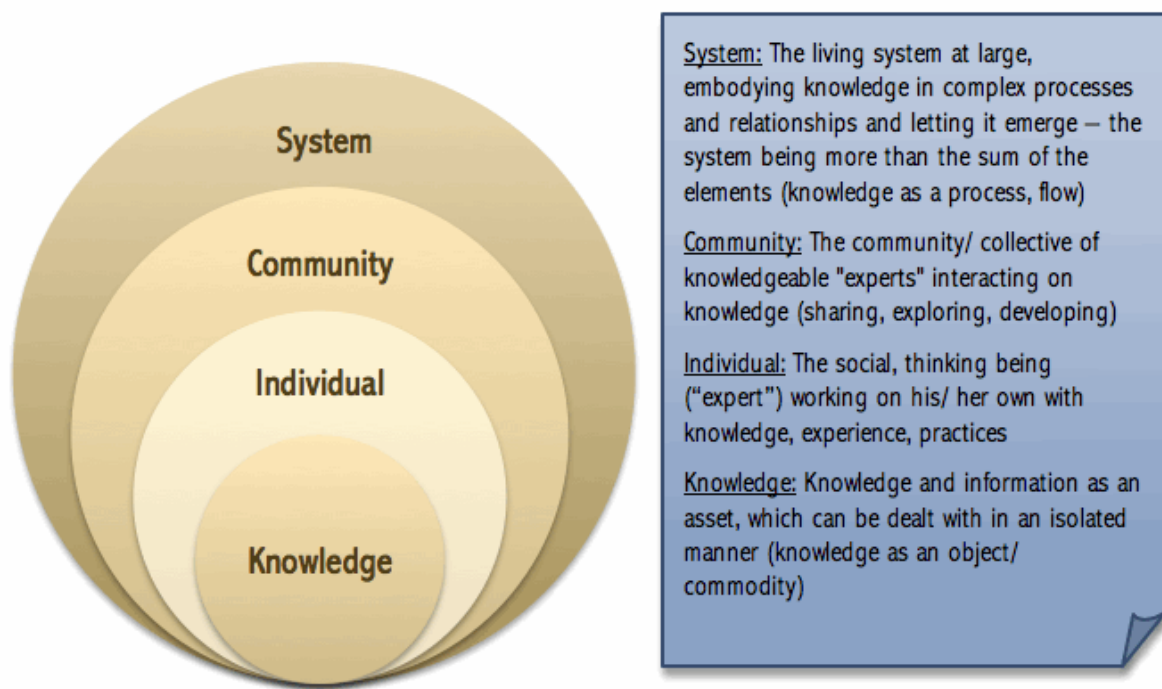
System: The living system at large, embodying knowledge in complex processes and relationships and letting it emerge — the system being more than the sum of the elements (knowledge as a process, flow)

Community: The community/ collective of knowledgeable "experts" interacting on knowledge (sharing, exploring, developing)

Individual: The social, thinking being ("expert") working on his/ her own with knowledge, experience, practices

Knowledge: Knowledge and information as an asset, which can be dealt with in an isolated manner (knowledge as an object/ commodity)

Figure 2: Circles of Engagement (Source: Weisbord, 2012)

Many authors has defined in many ways but **Peter Senge** from **Society of Organizational Learning (SOL)**, had nicely described below the three generations based on document people and system based knowledge management.

Table 2: Three (3) Generations of Knowledge Management

1st Generation: Document-based KM	2nd Generation: People-based KM	3rd Generation: System-based KM
Information for Decision Support (Prior to 1995: computerization of major applications).	Humanization of KM	The Organic Age of KM (Complexity of theories, understanding of organizations as learning and living, complex entities).
Aggregated, organized and analyzed information and data.	Skill of using knowledge to create something unique.	Complex phenomenon emerging from a social system (beyond the sum of individuals).
Stored in documents or data warehouses.	Stored in human brains.	Stored in systemic interaction and relations.
Extract, capture, store and disseminate information.	Interact, share and exchange knowledge	Co-creator, discoverer and transforming the sense & meaning.
Made available through search and retrieval.	Made available in human interactions.	Available on made for better understanding by conversation and creating sense & meaning.

Unwilling to share knowledge by human being	Eagerly desirous to promote their expertise skills and knowledge.	Depend on interaction to be knowledgeable.
Produce & provide information for rational management.	Share & learn for improvement and effectiveness.	Understand & innovate for sense-making and impact.

(Source: Uriarte, 2008; and Mvungi, & Jay, 2009)

Generation first of knowledge management came and gone while the second generation have potential to have more deeper impact and insights as it promised to focus more on the social nature of the human being rather on the knowledge stored on piece of paper, less emphasis on capturing and retrieval and more emphasis laid on collaboration, sharing and innovations and because of that we about know-how rather than know about – the only knowledge that ultimately matters in any pragmatic institution.

The next transition took place was the third generation where holistic approach of social system introduced means the ideas of society, organizations, communities and organizations which was earlier based on machine not yield a promising result and have less impact forcing them to depend on the more complex system which further produced a compels result rather simplifying it. So with induction of social human factor has have potential to sense-making and can reductionlised facilitate more collaborative of different social entities rather the command and control.

With the dynamic changes from generation to generation, knowledge management show the duel nature of two disciplines, firstly the system transformation and second one is the change management depend upon the organization where learning on the basis of knowledge sharing must be an inherent part of effective change processes.

The learning curve clearly show how the system improvement and change management took place over a period of time and have improve impact in complex social systems is to have all the members of s system jointly and collaboratively working on it in order to ensure seizing its complexity and diversity. **Weisboard** in **2102** showed the how effectively dealt with the problems rather focusing as an individuals than a group in identifying opportunities, possibilities and potentials.
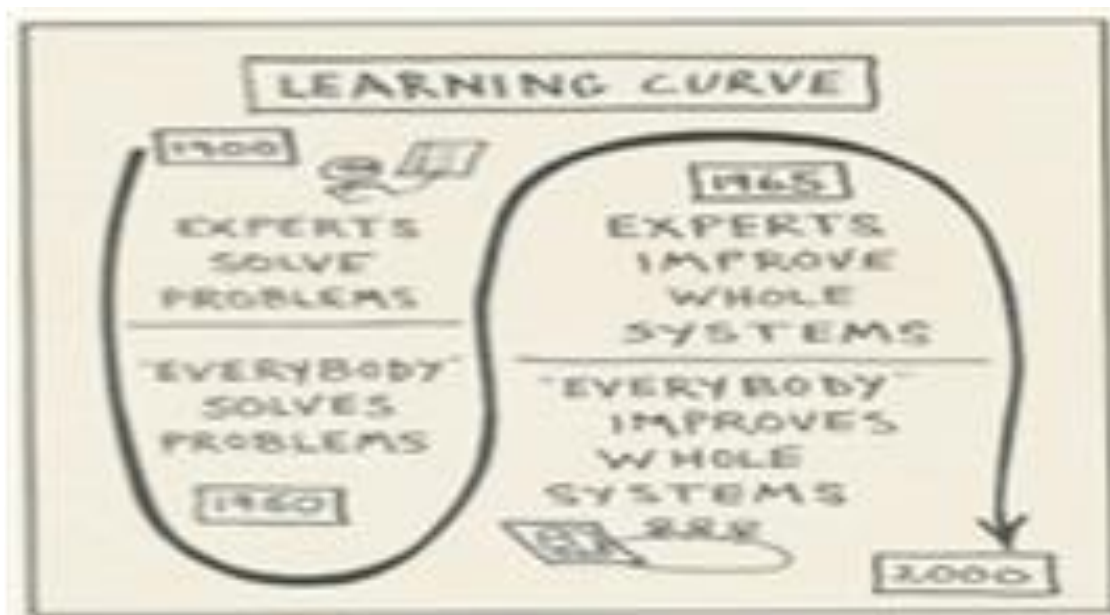
Figure 3: Learning Curve (Source: Weisbord, 2012)

Open Source Software are freely available in internet to which one can use and manipulate according to their need. There are multiple licensing obligation are that is the GPL or creative commons are applied to it but this will not restrict the freely use of the software's except the any party from selling or giving away the software as a component of an aggregate software distribution containing programs. By and large all the small and medium size libraries started automation using OSS for their day today housekeeping operations, this is due to budget constraints of libraries and high price of library Management software's which can manage the library operations. The major outcome seen with advent of the OSS is the digital library advancement, where most of the libraries involved and crated their digital library or intuitional repository where researchers can archive their research put and libraries can give access to the resources and services to end user, without investment of any increase on the finance part (Lee, 2009).

MAIN FOCUS OF THE CHAPTER

3. CONCEPT OF KNOWLEDGE MANAGEMENT (KM)

Many experts given different concept and definition of knowledge management over period of time, but putting it in more technical and accurately it is the strategic management of people and knowledge representations concerned with the content and information in an organization and with help of technology and processes these sets of content and information

can be used by transferring it directly among people or indirectly through systems for overall benefits of organization.

Table 3: What is KM?

Attributes	Definitions
Results-oriented definition	Applying the correct knowledge at correct place at correct time and in a correct format for decision making
Process-oriented definition	Related to strategic management of process by which correct knowledge is identified captured, classified, shared and applied
Technology-oriented definition	Use of Business intelligence, collaboration, search engines intelligent agents yield effective results

(Source: Benjamins, 2001)

Karl Sveiby (Sveiby, 2003) stated KM as, "The art of creating value from an organisation's intangible assets." Similarly Davenport and Prusak (Davenport, & Prusak, 2005) defined KM as; "KM is concerned with the exploitation and development of the knowledge assets of an organization with a view to furthering the knowledge objectives."

Despres, Charles and Chauvel, Daniele (Despres, & Chauvel, 2001) said KM as, "The purpose of knowledge management is to enhance organizational performance by explicitly designing and implementing tools, processes, systems, structures, and cultures to improve the creation, sharing, and use of different types of knowledge that are critical for decision-making."

According to the World Bank, "KM is the management of knowledge through systematic sharing that can enable one to build on earlier experience and obviate the need for costly reworking of learning by making the same repetitive mistakes."

4. INTEGRATED KNOWLEDGE MANAGEMENT MODEL

The Integrated knowledge management model played a pivotal role on linking the process and strategy and tries to assess the specific initiatives at different stages. This model point out the various relations exist between the information and information management systems with respect to Knowledge management where different elements presented by various scholars and practioners (Bukowitz, & Williams, 2000; Gamble, & Blackwell, 2001; Botha, Kourie, & Snyman, 2008; and Nonaka, & Takeuchi, 1995).

In this model, dark gray elements designate KM initiatives while yellow boxes depicts corporate strategy and the teal boxes shows data and information systems and repositories. The

entire process is started from the tactical and strategic considerations, showing by which how a KM strategy goes parallel with respect to corporate strategy. The Oval grey points the knowledge related processes within the organization as it performed and management affects enhances through its initiatives (Frost, 2015).
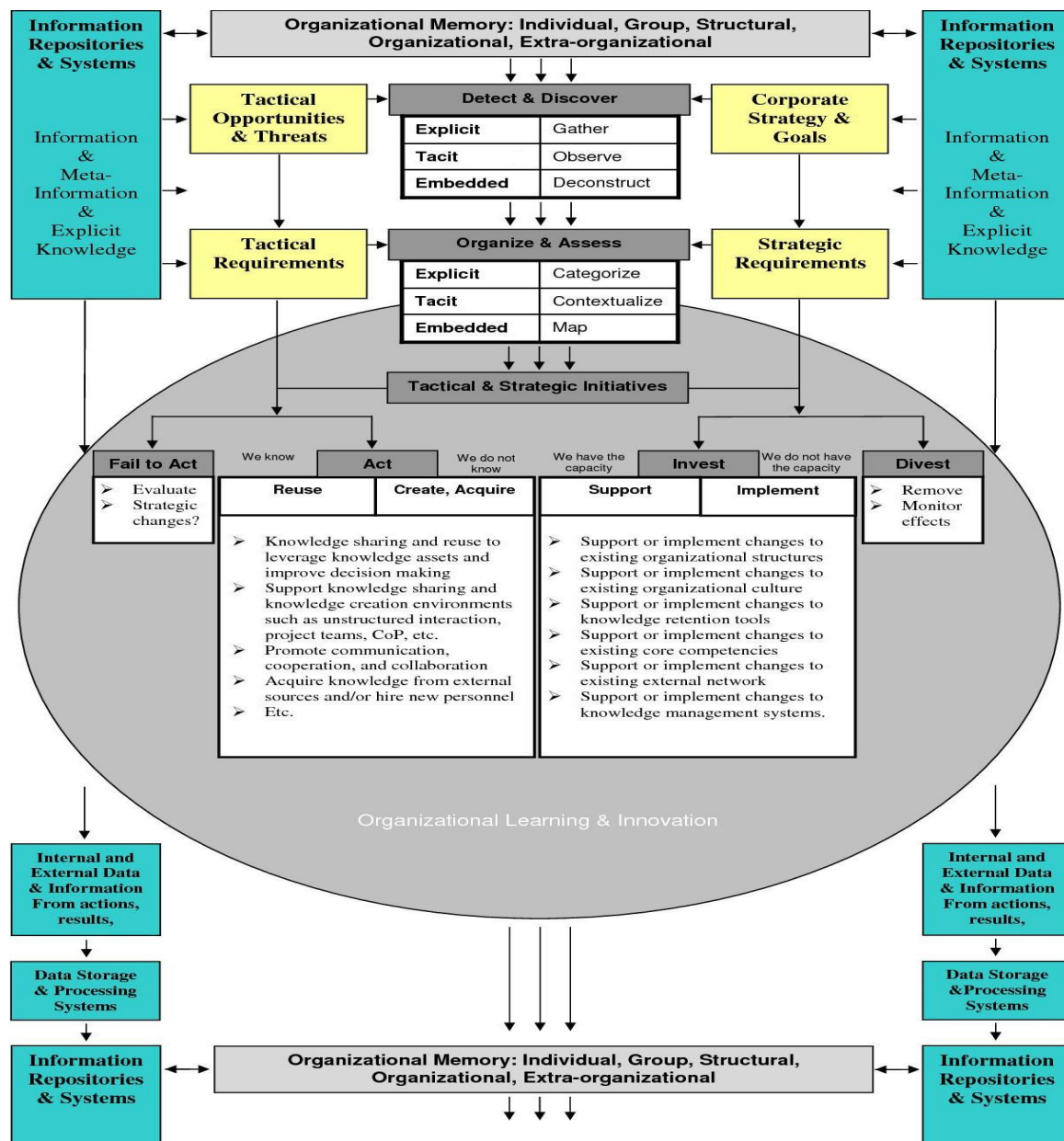

Figure 4: An Integrated Knowledge Management Model (Source: Frost, 2015)

5. A STAGE MODEL OF KM IMPLEMENTATION

This model combines perspectives of the life cycle theory and teleology to explain the process of building organizational capability of knowledge management. The overall progress

of stages is based on the life cycle theories adopting organic growth as a heuristic device to explain the changes of organizational behaviors and its progression as a process (Quinn, & Cameron, 1983; Van de Ven V, & Poole, 1995; Davenport, & Prusak, 1998; Nonaka, & Takeuchi, 1995; and Rajagopalan, & Spreitzer, 1997).

Table 4: Stages of Organizational Knowledge Management Development

		Initiation	Propagation	Integration	Networking
Goals		Get Ready for Enterprise-wide Knowledge management efforts	Infra-building and Activation of knowledge activities	Integration of knowledge management efforts to organizational outcomes	Linking knowledge management to external partners
Organizational Actions		Boradcast the needs of knowledge management	Set up a preliminary knowledge management process	Assess and evaluate the effectiveness of knowledge	Analyze internal and external knowledge management efficiency
		Judge ongoing problems of knowledge management	Build a reward Mechanisms	Scan the changes of environmental needs	Make knowledge alliances with partners
		Define and share visions and goal of knowledge management	Develop HRM programs	Monitor and control knowledge management activities	Share knowledge management visions and goals with partners
		Make a long-term knowledge management plan	Develop a knowledge catagorization	Define and focus on core knowledge areas	Link knowledge management with partners'
		Conduct benchmarks or pilot projects	Build a knowledge Management & with a knowledge base	Disseminate best practices of knowledge management	Facilitate within organizational knowledge sharing and collaborations
			Conduct events to activate knowledge activities		
Object Characteristics	**Org'l K**	Acquired	Created	Integrated	Networked
	K Worker	Absorber	Creator	Expert	Coordinator
	KM Process	Acquisition	Creation	Internal Sharing	Global Sharing
	KMS	Closed	Isolated	Enterprise	Global

(Source: Lee, Kim, & Yu, 2001)

6. THE KNOWLEDGE MANAGEMENT PROCESS (KM PROCESS)

The basic principle of knowledge management is same and universal to any organizations like the use of resources only the techniques and tools associated with KM get changed because of the organizational environment. There are six steps in KM process which transformed the data into knowledge in an organization with help of different tools and techniques.
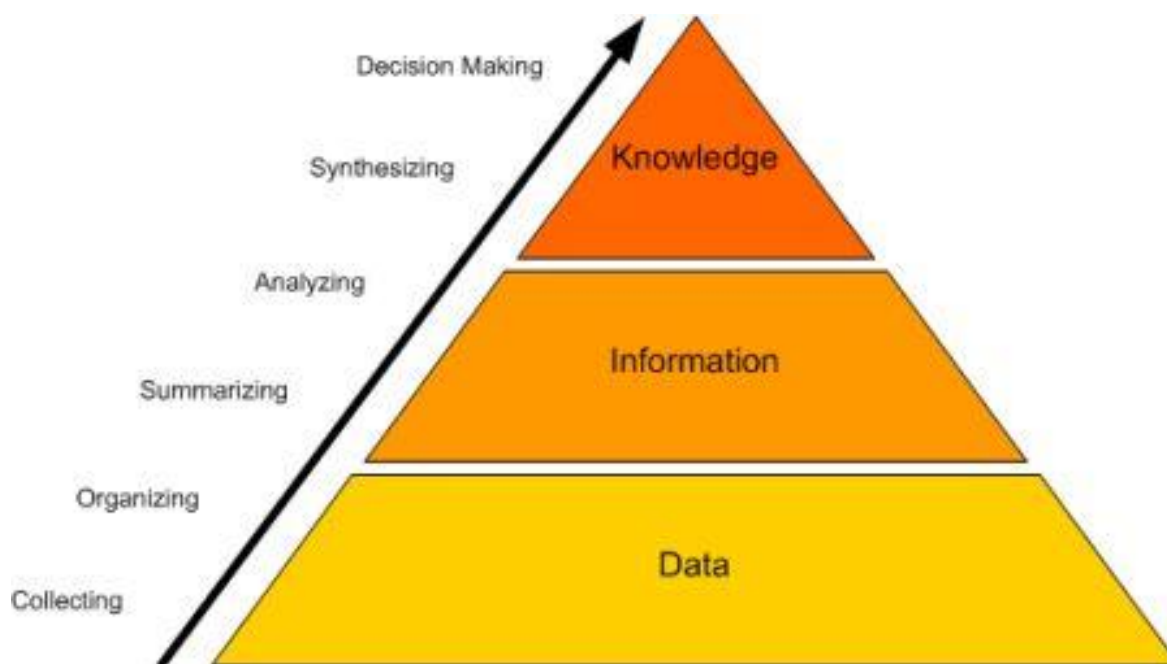

Figure 5: The Knowledge Management Process (Source: Edwards, 2011; and Kohl, Orth, & Steinhofel, 2015)

ISSUES, CONTROVERSIES, PROBLEMS

7. KNOWLEDGE MANAGEMENT TOOLS (KM TOOLS)

There are many channels by which knowledge originates in an organization but under knowledge management process it is gathered and disseminated through a set of channels, processes and protocols. The tools of knowledge management extensively support knowledge generation, knowledge codification, or knowledge transfer. It is not necessarily that all the tools computer base but there is other mode of traditional KM tools also exists.

7.1. Requirement of Knowledge Management Tools

The KM tools intended to do acculturation, inclusion of information and knowledge by which an individuals or a group can transform data and information into knowledge. It is often

observed knowledge is adhered to individuals who creates it and which may develop doubts on availability of information systems tools to effectively support KM (Firestone, & McElroy, 2002; and 2003). Thus there is need of tools which can support, collect organize and share the knowledge embedded in various forms in an organization in different media (Miller, 2005).

Table 5: Requirement of Knowledge Management Tools

Reasons	Explanations
1. Facilitate Information Contextualization (FIC)	Under FIC metadata on its characteristics and integration within a specific environment must be attached to it before storing which facilitates better retrieval and management for the knowledge seeker.
2. Intelligently Transfer Information (ITI)	A tool that can optimize and provide information according to the needs of the users, respecting one of the key functional foundations of KM.
3. Facilitate Social Interactions and Networking (FSIN)	Direct communication and verbal knowledge transfer through social interactions among individuals is the most natural aspect of knowledge sharing.
4. Customized Human-Computer Interface (CHCI)	Support interface customization and ease of use. The human-computer interface, ease of use and usability will drive intention to use and reuse the tools.

(Source: Ghani, 2009)

7.2. Evolution of IT Tools In Knowledge Management

7.2.1. Some Categories of IT Tools Commonly Associated with Knowledge Management

Some categories of IT tools commonly associated with KM are shown in **Table 6** (Ghani, 2009):

Table 6: IT Tools Commonly Associated with Knowledge Management

Categories	Characteristics	Technology	Description / Examples
1.Traditional Database Tools:	These tools attempt to allow users to create general data properties implicitly within a database. They allow for the creation of objects that have certain properties, can communicate with other objects and so on.	AI technology	Expert systems, learning systems.
2.Process Modeling and Management Tools:	Processes that involve the transformation of physical material have been the focal metaphor. Tools have been built to support these processes encode considerable knowledge of the process.	Communication and collaboration systems group	E-mail, teleconference, video conference, chat, IM, forum, Listserv, groupware calendar, log, shared information spaces workflow management system, group decision support system.

3.Workflow Management Tools:	These are the process management tools for information-intensive organizations. Workflow tools allow for the specification of the movement of documents in information processes.	Documents management system	Management of electronic documents, a system to search, edit, distribute, retrieve, archive and otherwise mange the complete lifecycle of documents.
4.Enterprise Resource Management Tools:	Enterprise modeling tools are being developed to provide all the modeling capabilities of ERP / ERM systems along with the explicit representation of organizational and environmental knowledge.	Content management system	Management of electronic content including multimedia files.
5.Agent Tools:	These tools rely on agents, relatively autonomous programs that can perform a variety of tasks. Agents may be provided with the specifications of the information that the user is interested in and these will then search the web and specified other databases to find the information.	Intranet	A network contained within the enterprise. It is used to share information and computing resources among employee as well as to facilitate group working.
6.Search Engines, Navigation Tools and Portals:	Some of the search engines perform automatic text-only searches while others relied on human "interpreters" who would access web pages and then analyze and classify them.	Search engine	Tool that searches the contents of a web.
7.Visualising Tools:	These tools have been developed to investigate the structure of knowledge domain and knowledge within domains. These tools have been used for data visualization in the areas of financial market to molecular biology.	Learning system	Distance learning, e-learning and computer-based training.
8.Collaborative Tools:	These types of tools are provided for setting of bulletin board and for real-time video conferencing, whiteboards, and chat rooms.	Knowledge mapping tools	Any resource that locates people by their knowledge; human resources skill set inventory system.

(Source: Ghani, 2009)

7.2.2. Categorisation of Tools Based on Different Types of Knowledge

Based on the knowledge types there are four different types of KM tools exist which not only help but facilitate the knowledge transfers is described in **Table 7** (Vizcaino, 2007):

Table 7: Types of Knowledge and Different Types of Knowledge Management Tools

Explicit knowledge	Know how	Know who	Tacit knowledge
System tools	Collaboration tools	CRM tools	Video conferencing
DBMS	E-mail	Social network analysis	Face-to-face facilitation
Data warehousing	Groupware	Knowledge portals	Other technologies

(Source: Ghani, 2009)

7.2.3. Web-based Information Technology Tools for Knowledge Management

Web had great potential for offering the tools that supports all stage of Knowledge management as it allow to integrate the different aspects of tools for representational and communicational media.

7.3. Tools Available for Knowledge Management

A number of tools are available to support the functionalities and processes of KM, which are listed below:

Table 8: Tools Available for Knowledge Management

Tools	Examples / Vendors	Tools Attribute / Applications	Web Link
1. Tools for knowledge access:	1. **Convera** is a tool used for retrieval ware. It works on powerful indexing systems to classify expertise based on both content and collaboration dynamics and networks within the enterprise.	Helps in providing access to explicit knowledge that can be shared and transferred through the enterprise information systems. RetrievalWare 8.	www.convera.com
	2. Fast	Fast ESP	www.fastsearch.com
	3. Entopia	K-Bus	www.entopia.com
	4. Exaled	Exaled Corporate	www.exalead.fr
	5. Autonomy Verity	Idol K2	www.autonomy.com
2. Tools for semantic mapping:	1. **Anacubis** is a ground-breaking visual research and analysis software for corporate researchers, analysts, and intelligence professionals. It supports the visual discovery and analysis of intelligence in both online and enterprise information.	These tools are meant to quickly support presentation of information, analysis, and decision making. Anacubis Connect.	www.anacubis.com
	2. Inxight	VizServer	www.inxight.com
	3. Kartoo	KartooKM	www.kartoo.net
	4. MapStan –Amoweba	mapStan	www.amoweba.com
	1. Cerebra	Cerebra suite	www.cerebra.com

3. Tools for ontologies mapping:	2. Mondeca	ITM	www.mondeca.com
	3. Ontopia	Knowledge suite (OKS 3.0)	www.ontopia.com
	4. SchemaLogic	Enterprise suite	www.schemalogic.com
4. Tools for knowledge extraction:	1. **ClearForest** Text Analysis Suite is an advanced text driven business intelligence solutions which apply intelligent mark-up to key entities such as person, organization, location, as well as detailed facts or events embedded within free-form text such as news articles, web surveys, and HTML documents.	Support structured queries and replies. They help mining text by interpreting relationships among different elements and documents. ClearForest Text Analysis Suite.	www.clearforest.com
	2. Intelliseek	Enterprise Mining Suite	www.intellisik.com
	3. Insight	Insight Smart Discovery	www.inxight.com
	4. Lingway	Lingway KM	www.lingway.com
	5. Temis	Inxight Discovery Extractor	www.temis-group.com
5. Tools for relationship discovery:	1. Grimmersoft	WordMapper	www.grimmersoft.com
	2. SPSS	LexiQuest Mine	www.spss.com
6. Tools for expertise localisation:	1. **ActiveNet** maintains a continuous, real-time view of organisational activities. ActiveNet continuously discovers each person's work activity and business relationships by processing communications from such sources as documents, discussion databases, e-mail, instant messaging and digital workspaces.	Enabled quick location of the knowledge holders in the enterprise and facilitate collaboration and knowledge exchange. Tacit.	www.tacit.com
	2. Agilence	Expertise Finder	www.agilence.com
	3. Kankoon	Kankoon Skol	www.kankoon.com
7. Tools for collaborative editing:	1. Interwoven	TeamSite6	www.interwoven.com
	2. Open Source	Drupal	www.drupal.org
	3. Six Apart	Movable Type	www.movabletype.org
	4. Vignette	Vignette V7 Content Services	www.vignette.com/fr/
	5. Xerox	DocuShare4	http://docushare.xerox.com/
8. Tools for collaboration work:	1. **QuickPlace** is a Lotus's web-based shared workspace software for real-time collaboration among geographically dispersed participants.	These tools enable teams to globally share dedicated spaces for managing the project lifecycle; editing and publishing materials; conducting live discussions and interactions; and maintaining a repository of materials associated with every step of the process. IBM / Lotus.	www.lotus.com

	2. EMC – Documentum	eRoom	www.documentum.com/eroom
	3. Affinitiz	Affinitiz	www.affinitiz.com
	4. Microsoft	SharePoint Services	www.microsoft.com
	5. One2Team	One2Team Pro	www.one2team.com
	6. Tomoye	Simplify 4.0	www.tomoye.com
9. Tools for real time collaboration:	1. Marratech	Marratech e-Meeting Portal	www.marratech.com
	2. Microsoft	Live Communication 2003	www.microsoft.com
	3. Microsoft	Windows Messenger	www.microsoft.com
	4. WebEx	Meeting Center	www.webex.com
	5. Yahoo	Yahoo Messenger	www.yahoo.com
10. Tools for business process management:	1. Boc	Adonis	www.boc-eu.com
	2. IDS Sheer	Aris Process Platform	www.ids-scheer.com
	3. Mega	Mega Process	www.mega.com
11. Tools for workflows management:	1. FileNet	Business Process Manager	www.filenet.com
	2. TIBCO	Staffware Process Suite	www.tibco.com
	3. W4	W4	www.w4.fr
12. Tools for Global Solutions and Suites:	1. Ardans	Knowledge Maker	www.ardans.fr
	2. Thalès-Arisem	KM Server	www.arisem.com
	3. Knowesis	Athanor	www.knowesis.fr
	4. Knowings	Knowledge Manager	www.knowings.com
	5. Sharing Knowledge	SK2	www.sharing.com
	6. Autonomy	Portal in a Box	www.autonomy.com
	7. HummingBird	Humming Enterprise	www.hummingbird.com
	8. IBM	Suite Lotus	www.ibm.fr
	9. OpenText	LiveLink	www.opentext.com
	10. Oracle	Enterprise Manager, Collaboration Suite, Data Hub	www.oracle.com
	11. Plumtree	Enterprise Web Suite	www.plumtree.com
	12. Vignette	Vignette V7	www.vignette.com

(Source: Balmisse, Meingan, & Passerini, 2007; and 2009)

7.4. Content Management System (CMS)

Content Management system not only manages the content part but it has great potential for knowledge creation, management and dissemination of information or content to internet, intranet in an organization, extranet, or a website. Some of the leading CMS are shown in **Table 9**:

Table 9: Open Source Content Management System:

Name	Features / Characteristics
1. Drupal:	Readily available, freely and open source released under GNU General Public License based on PHP, can use for CMS and content management framework (CMF).
2. Joomla:	Frequently used for content publishing on WWW and within the organization. Have model–view–controller (MVC) which also facilitates to develop Web application framework independently.
3. eZ Publish:	Developed by the Norwegian company eZ systems, used frequently by the corporates for websites and personal websites. This is based on PHP and can be used for commerce and building online communities as having role-based multi-user access.
4. TYPO3:	This CMS have two ends called as front end which is for visitor to display content to end user while backend have administrator's role for updating the content.
5. XOOPS:	XOOPS stand for eXtensible Object Oriented Portal System. This came initially for building and developing the portal system but later switch to Web Application Platform.
6. Nuxeo:	One of important CMS for KM platform gives a solid software foundation to build Knowledge Management and Knowledge Base solutions as rich in many unique features.

While moving for KM Software it's very important to see the feasibility to opt Product or Platform and go judiciously, otherwise it's become cumbersome at later stage in implementing as well as on budgets. In this regard, a comparative study is done *"Why Platform and not Product?"* will be beneficial some the reasons are listed below in **Table 10**: **Why Platform and not Product?**

Table 10: Platform and Product

A) **Platform for KM**	B) **Product for KM**
• Independency-one can customize by acquiring technical expertise • Exposure to Technology • Easy Integration • Future projections can be possible in platform software • Leading organizations implemented because of the ease and other customize rich features. • Less Price compare to ECM Product	• Dependency-Fully depend on the technical support • Non-availability of Source Code for development of in-house capacity not possible • Future projections vs. obsolescence-less in product and chances of obsolescence will be more • Only Top MNCs implemented • Workflow management may not suit to your organization • Difficulty in integration-Highly Specialized, so creates difficulty in integration. • More customization cost which leads to budget constrain.

SOLUTIONS AND RECOMMENDATIONS

8. MAPPING OF KNOWLEDGE MANAGEMENT TECHNOLOGIES

In order to come up with knowledge based organization where continues learning and capturing can be possible with help of ICT tools of the major tools which can capture the knowledge is discussed below:

8.1. Case-based Reasoning Systems:

This mechanism consist of two part one first one is the case in the form of knowledge and other part is the software system which have capability to analyze the case and retrieve it. Here the collection is case of different ideas across business functions of an organization of different industries. Each case has brief description, environmental conditions, competitive situation, experience and management priority and values. The software system built an index of each case that search result yields modest number of "similar cases to users.

Some of the examples of this are *ontologies, taxonomies and knowledge mapping tools, profiling, clustering, collaborative filtering and data mining tools, etc.* (Saito, & Umemoto, 2005).

8.2. Group Decision Support System (GDSS):

It is developed by **DeSanctis** and **Gallupe (1985)**. A Group Decision Support System, or GDSS, comparises of interactive software which allows for making decisions by a group of participants. There are many decisions in an organization needs the collaboration and participation of multiple individuals for effective and overall benefits of organization. This support system based on individuals' mental model and experience used as ingest data in this system for decision making. The example of GDSS may be *nominal group technique, the Delphi technique, and computer-based approaches (teleconferencing, and video conferencing)* (Ghani, 2009).

8.3. Artificial Neural Networks (ANN):

ANN is the derivatives of artificial intelligence and become the essential component of information processing helps in capturing the pattern findings and structuring of tacit knowledge without any prior information. It can be used for variety of purpose such as document management, groupware and e-learning systems after embedding with KM applications (Saito, & Umemoto, 2005). The major area where ANN is applied are *system identification and control where vehicle control, natural resources management is done. Similarly data mining (or knowledge discovery in databases), visualization and e-mail spam*

filtering, decision making (e.g., chess, poker), pattern recognition (e.g., radar systems, face identification), sequence recognition (e.g., gesture, speech, handwritten text recognition) this technology is used for knowledge mapping.

8.4. Semantic Search Engines and Link Machines:

Semantic search engine improve search accuracy by matching the users search query and the contextual meaning of terms as they appear in the searchable database. The Search engine built a network of keywords and transforms the natural language query in a number of most probably related keywords and them these keywords can be related to pieces of text where they appear dominantly. Once these keywords were identified give text is coded with certain keyword and table is made which is readily understood by the semantic queries and semantic linking (Davies, Duke, Kings, Mladenic, Bontcheva, Grcar, Benjamins, Contreras, Civico, & Glover, 2005).

For example, KartooKM provides many different views from centric mapping; to clustering; topographical maps; interactive trees; closeness and social networks maps; circular maps; and animated charts. Various ontology tools are considered as example as it help in organizing information and knowledge by individual or groups and schemata that represent the organizational knowledge base (e.g., Ontopia Knowledge Suite, OKS 3.0) (Parpola, 2005).

8.5. Information Visualization:

Information visualization is about utilizing interactive graphics that focuses on the use of visualization techniques to help people understand and analyze data and support decision making. By respecting the constraints of perception, cognition and motor systems and considering the leveraging our strength it can be feasible to interact with large amounts of information than possible with previous graphical interfaces.

Examples: Datawrapper, D3, InstantAtlas, WolframAlpha, Gapminder World, Tagxedo.

8.6. Knowledge Extraction:

Knowledge Extraction is about extracting the attributes from the datasets (documents) or corpora (collections) can be easily used in sense making or decision over a period of time. This extracted attributes which is called as metadata is valuable in guiding access and use of the information and often for automating portions of the work. These extractions used in computational techniques to recover and represent attributes of text and images that the human easily interprets and can enable the human to understand content and context and guides knowledge work even in the face of volume. *For example, vivisimo.com clustering, resulting*

in structured and more articulated answers. Some sophisticated data and text analysis tools also support the identification of relationships among concepts, using sound and rigorous statistical association rules (e.g., SPSS).

8.7 Non-Technical Knowledge Management Tools:

A number of non-technical KM tools available out of this few are listed below which are extensively used for the sharing and dissemination of knowledge assets. These are as follows:

a) **KM Training and Education:** It includes online and offline course on KM, Workshops & Seminar, knowledge games, books Journals etc., which enhances a free and open environment for interaction and learning about basics of KM to a group.

b) **Story telling:** Very effective and old technique to share the norms and values and of course the tacit knowledge of individual to a group. It also generates an emotional connection which will have long term effect for future.

c) **Mentoring:** Provide guidance from expert to aspiring expert. It's a way for passing the tacit knowledge as an investment in the future knowledge stock of the organization.

d) **Knowledge Café:** It's typically a group consists of handful of people together have conversations typically it's consisting of 15-20 minutes presentations on topic of importance followed by rounds of conversations in group.

e) **Communities of Practice (CoP):** Commonly called as CoP a group of people who share a passion for something that they can do and for that they regularly interact to learn the things and continues try to do the things in more effective way.

f) **Knowledge Exchange (KE):** KE is the mutually beneficial sharing of any ideas, data, experience, and expertise between academics and non-academic organizations to come with research idea or new model, this is seen in IT companies while developing a new database model.

9. NEED AND CHARACTERISTICS OF OPEN SOURCE SOFTWARE FOR KNOWLEDGE MANAGEMENT

Open source played an effective role in the capturing the tacit and explicit knowledge and can be used by organizations, and companies to capture, manage and access whenever it is needed for the overall benefit of organizations. According to the "Open Source Initiative," open

source must have the following characteristics which are listed below (The Open Source Initiative, 2001):

9.1. Free Redistribution	9.6. No Discrimination against Fields of Endeavor
9.2. Source Code	9.7. Distribution of License
9.3. Derived Works	9.8. License Must Not Be Specific To A Product
9.4. Integrity of the Author's Source Code	9.9. License Must Not Restrict Other Software
9.5. No Discrimination against Persons or Groups	9.10. License Must Be Technology-Neutral

10. NEED OF OSS FOR KM

In spite of all the pros, OSS gives a need for the governments to intervene and promote it through policies or through legislations. The below said reasons are needed to formulate an OSS policy:

10.1. Less Efforts of Marketing:

Even though proprietary software led to an economic boom in the software industry but the benefits are for a chosen few. Developed countries benefited a lot mostly while the developing economics have to sell out a part of their foreign reserves, both at governments purchase software's to run on computers installed in various government and personal level to procure these proprietary software's. Apart from this they have to spend a lot for system maintenance, upgrading of software etc.

10.2. Prolonged Usage of Proprietary Software:

Proprietary software caused a huge investment in terms of capital to build the hardware infrastructure and training to develop the skills sets to professionals. Many organizations hesitates to switch over to another operating system as they have already existing infrastructure so moving from existing to new causing threat in implementation of OSS. Therefore governments have to formulate policies that will give the right momentum on the uptake of OSS for overall benefit.

11. DEVELOPING AN OPEN SOURCE POLICY FOR KM

Many developing countries of world recognized the importance of open source software policy, they have adopted, start feeling the real essence of OSS and its policies. Some of the

countries came forward are India, China, Malaysia, South Africa and many more realized the strategic value, economic and social benefits of OSS (Kumar, & Singh, 2009). Some of the values are described below:

Developing an Open Source Policy for KM
11.1. Strategic Benefits:
11.1.1. Helps to boom Local Industry: OSS facilitates to use and develop software. as OSS can be freely redistributed, which means that a software can be used or shared by people without having to pay any additional costs for upgraded versions of any particular software under usage.
11.1.2. Discourages Imports but Enhanced Foreign Reserves: OSS offers an alternative to developing nations because of the nature of its licensing terms which permits its user to freely use, modify, develop, distribute and copy these software's. OSS can be obtained at little or no cost and thus saves foreign exchange of a country, which can be utilized in other developmental projects.
11.1.3. Cyber security: Proprietary Software is distributed in binary format; therefore, it is very difficult to reverse engineer and understand exactly what a program does. The binary files may have some sort of mistrust as it has virus and   a remote hacker tampering with the date.
11.1.4. Copyright Infringement: Software piracy is a worldwide problem. OSS assists in eradicating software piracy as it is a low cost alternative to proprietary software that is expensive for most people in developing countries.
11.1.5. Enables Localization: Countries whose native language is not English is having cons when we talked about awareness of ICT as in many cases proprietary software makers are not interest in producing or developing a localized version of respective countries for ease use.
11.2. Economic Benefits:
11.2.1. Gives drift to Competition: The existing market has many barriers as it need huge capital investment. So Thus, OSS has been instrumental in bringing new competition in the market that was for a long time the monopoly of big proprietary software giants.
11.2.2. Reduces Total Costs of Ownership (TCO): OSS reduces the cost of implementation and can be freely distributed. Also OSS lowers costs through, alias among other thing, better security in with respect to proprietary software.
11.2.3. Enhances Security: None of the operating system can be fully proof and secure. Nevertheless, factors such as source code and method of development affect the security of any software system, as they are important components of software. A typical OSS also includes a wide variety of security tools, which allows any proficient system operator to scan his own network for vulnerabilities.
11.2.4. Achieves Vendor Independence: It provides the user the liberty to modify and develop a program according to one's personal needs and requirements as OSS gives rights to manipulate to source code; t so, it is easy to reverse engineer any data format or standard.
11.3. Social Benefits:
11.3.1. Enhanced Access to Information: It bridged the digital divide because with OSS one can take advantage which is often overlooked by the advocates of OSS policy.

(Source: Kumar, & Singh, 2009)

12. IMPACT ON LIBRARIES

12.1. Globalization: *There are many studies suggested that* use of OSS is increasing globally day by day. In spite of marketing against OSS by the lobby of proprietary software,

the attitude of the custodians, knowledge managers and libraries and information centers is very much positive for using OSS globally.

12.2. Localization: *The Open source Software gives and IT environment based on* local freedom and possession so can be adapted easily and have more independence and flexibility for software development process.

12.3. Liberalization: The users of OSS are having full liberty to use it and to make necessary modifications according to the choice of customers. Community participation is also more valuable.

12.4. Commercialization: As the software has become the part of life of a human being, the people need to have access available in the market or on Internet to fulfill their day to day requirement.

13. IMPERATIVES MOTIVATED BY THE 5 LAWS TO KM

The five laws of library science was enunciated Dr. S. R. Ranganathan who was the father of Indian library science and his 5 rules still have relevance in the present scenario **(Ranganathan, 1957; and 1963)**. In the year 2004 Noruzi revised these rules in context of today's digital environment for users and web resources is explained in **Table 11**.

Table 11: Imperatives Motivated By the 5 Laws: Then and Now

Environment / Five Laws	Digital Environment		
	Web Resources	**Software Library**	**Institutional Repositories (IR's)**
Books are for use (Ranganathan, p. 26)	Web resources are for use	Software is for use	IR provides the documents to its users in its right format to their desk.
Every reader, his or her book (or Books are for all) (Ranganathan, p. 81)	Every user his or her web resource	Every user his or her software (or software is for all)	IR's can find out pin-pointedly the Books / Documents / Information needed by every user for his / her use.
Every book, its reader (Ranganathan, p. 258)	Every web resource its user	Every software its user	IR facilities information search and retrieval, guiding user to reach his / her to meet its right user.

Save the time of the reader (Ranganathan, p. 287)	Save the time of the user	Save the time of the user	Interface's in IR saved the time user, enabling the users to use friendlier mode of communication such as downloading, e-mailing, printing, etc.
A library is a growing organism (Ranganathan, p. 326)	The web resource is a growing organism	A software Library is a growing organism	Library space constraint is a great concerned today IR ability to store huge collection in a small storage device in size and help to overcome all the concern problems and preservation.

(Source: Cloonan, & Dove, 2005)

14. Merits of OSS for KM

The advantages of using the Open Source software to implement solutions are:

14.1. Lower Software Costs: Costing of OSS is much lower at this don to require any licensing and maintenance fee, only the incurring expenditure related to it will be for media, documentation and support if needed.

14.2. Lower Hardware Costs: Most of the Open source is compact and portable which need a less hardware requirement compare to the conventional servers, thus reduces the pricing of hardware.

14.3. Simplified License Management: It's free from license compliance download the software once and install as you require at nay place there is no tracking system for it like counts track or monitor.

14.4. Scaling / Consolidation Potential: Open source and linux can be easily scalable so multiple clustering and load balancing is not issue. OSS has ability to scale up for new growth or consolidate to do more with less.

14.5. Support: Now almost all the OSS has support system through community involved and offered superior support system as compare to proprietary one. There are many technical players came in the market which provide support to open source software by offering bare minimum pricing.

14.6. Escape Vendor Lock-In: The main beauty of the OSS is free from vendor locking. One can do the portability and customization as many to meet the specific need of your user**.**

14.7. Quality Software: There is much evidence and research which clearly shows the OSS is good stuff as they have to go through many peer review process and community standards and since source code is open to world so that they can easily see the flaws and rectified quickly, which brought excellence in design and efficiency.

14.8. Unified Management: *Open sources* technologies like Common Information Model (CIM) and Web Based Enterprise Management (WBEM) offered a great capability to bind server, service application and can manage workstation effectively.

15. CHALLENGES AND DEMERITS OF OSS

15.1. Monopoly of Developers: This will facilitate easier support of OSS and offers advantages over developers of proprietary software and their monopoly.

15.2. Foreign Trade: IT is major player in contracting the world in a small cafe and due to this shrinkage foreign trade is being affected mainly in developing countries.

15.3. Copyright Infringement: OSS is being used in the society beyond copyright infringement. However, copy system from one OSS to another OSS has been seen which should be controlled.

15.4. Lack of ICT Tools: Many developing countries do not have sufficient Information and Communication Technologies Tools due financial crises or lack of awareness about the latest ICT Tools to make proper use of OSS.

15.5. Local Language: IT basically is based on the English language and maximum OSS is developed in English language only. But, many other languages are also in use globally in the society. For example, in India nearly 417 languages are in use and out of it only15 languages are recognized by the Government of India.

Although, OSS has some disadvantages in their characteristics, which are briefly given below:

- Limited or no accountability
- Informal and unaccountable support channels
- Proprietary solutions and technologies
- Contractual engagements
- No guaranteed support;
- Less variety of applications in market The risk of "closure" of projects
- Unrestricted use

16. REMARKS AND SUGGESTIONS

From the above study, it has been observed the following remarks and suggestions:

1. To find out and incorporate the finding of the users, the first version of the OSS should be released as early as possible.
2. Users of OSS also included in the developing team and he should be treated as a supportive and active member of the team.
3. During OSS development, the concept of modular planning should be adopted to modify the software as and when is required.
4. Local language factor may also be kept in mind as India is a multilingual country.
5. Foreign policy and foreign trade may not be affected due to OSS.

17. FUTURE RESEARCH DIRECTIONS

This study has limitation which needs to overcome to come up successful and robust KM system. At beginning the suggested model must be tested with empirical research which fills the preaching and practice in Knowledge Management. And at last, how effectively opens source software's can play important role in terms of its application with knowledge management systems for efficient delivery of information and knowledge in an organization.

18. CONCLUSION

The focus of the Knowledge Management is to manage the knowledge assets exist in an organization. This starts from generation of information and knowledge, classifying it and sharing for effective decision making process. There is no promising agreement is made what a technology offer but certainly it facilitates decision support systems, collaboration tools, content management systems and communication tools.

With advent of Web 2.0 tools laid a great impact on user participation as it help them collaboration, communication and knowledge sharing. By building information systems which can fill gap between humans and for knowledge work, is not enough there are certain tasks needs more attention like culture change to implement the KM system in organization, needs specialized technologies and tools to dealt with large amount of information, variety of sources and off-course understanding the changing need of broad range of user. Information professionals and the IT professionals worked together for effective implementation of OSS

KM tools in tapping the knowledge resources, as it provides better opportunities to the library and information centre for managing information, dissemination of information, developing WEBOPAC, managing the e – library, etc.

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