An Integrated Organizational Knowledge Management Framework (IOKMF) for Knowledge Creation and Usage

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ABSTRACT

Problem Statement: Knowledge management (KM) entails the production, processing and consumption of knowledge and information that has been gathered over a period of time for the purpose of improving and escalating the resourcefulness of the company resources. Role of KM in effective software project management (SPM) has turned out to be of supreme importance for necessary competitive advantage. Knowledge management systems (KMS) in a software organizations (one that focuses on software development), manages the flow of organizational information and its knowledge to a larger extent. This paper examines the relationship between KM practices and their role towards effective SPM, in the information technology (IT) industry.

Methodology: In order to identify the knowledge management framework and accompanying parameters that lead towards effective SPM, a longitudinal research has been conducted. Analysis has been conducted though participative and collaborative inquiry of the research subject. Mainly qualitative analysis is used for overall research.

Results: Software organizations in Pakistan are making use of knowledge management practices to facilitate their knowledge management needs. This in return is having a direct impact on the project management practices of the PMs. KM practices are also playing an indirect role in the overall success of the organization, by impacting some core factors. Collectively KM practices and sources are playing a contributing role in helping not only the PMs but almost all the stakeholders of the project in specific and organization in general.

Originality: This paper presents a verified and validated modular framework that improves the flow of knowledge and information during the entire software development process, for effective software project management. This research paper presents framework for knowledge creation for organizations working on software based projects. The proposed framework has been formulated after qualitative analysis of the subject matter. The proposed framework i.e. IOKMF has been partially implemented in selected organizations and results have been captured, verified and validated. Overall effect of using IOKMF is minimization of rework, increased productivity, quality, efficiency and effectiveness. The proposed model is a first of its kind. The paper also explains how IOKMF is different from previous work and also explains how IOKMF can be used and how it has been formulated.

Keywords: Knowledge Management, Project Management, Technology, Management, Effectiveness.

INTRODUCTION

<u>Motivation and Objective:</u> The motivation behind this research is in identifying the KM practices used in software industry of Pakistan; the role these practices play in assisting the project managers in performing their project management activities and to derive a desired KMS based on the research findings that could bring all the project stakeholders on one platform.

<u>Scope:</u> Literature review of the global knowledge management practices reveal that knowledge management has enormous application in the IT industry and in order to explore the applicability of KM practices the scope of the current research has been reduced to IT organizations of Pakistan where knowledge management practices are in use. These organizations are immature and are in the developing stages as compared to the global software industry. Integrated Organizational Knowledge Management Framework (IOKMF) for Knowledge Creation has specifically been tested for the IT organizations of Pakistan.

LITERATURE REVIEW

KM is emerging as a primary strategic resource in the 21st century and many organizations are beginning to initiate and implement it (Wonga & Aspinwall, 2006). Knowledge is an essential organizational driver and helps in changing organizational culture through organizational learning. Knowledge and information in an organization flow from variety of sources, through various practices. The history of knowledge is long enough to be referred to many centuries ago, however, its role and value has significantly changed in past decades (Ansari, Khobreh, Nasiri & Madjid Fathi, 2009). Innumerable researchers have presented theories, methodologies, and frameworks and have conversed on various KM concerns. However, KM still requires extensive development – it is in its immaturity (Metaxiotis, Ergazakis & Psarras, 2005).

Literature on knowledge management has shown that there are three types of knowledge in an organization, Tacit, Explicit and Cultural Knowledge. Tacit knowledge is the knowledge or information rooted in action or experience that is formed around intangible factors (Ansari et al., 2009). Explicit knowledge is the knowledge or information stored in documents or other form of media (Evans & Lindsay, 2005). The stronger the integration between these three knowledge types the greater the chances of an organization to succeed. Knowledge management is widely regarded as the way an organization can leverage the tacit and explicit knowledge of its employees, trading partners, and outside experts for the benefit of the organization (Sharif, Zakaria, Ali & Rozan, 2005). Knowledge management system in an organization provides a platform for these knowledge types. There is difference between knowledge management and information management. Information management focuses on data and knowledge management focuses on information.

The modern era is the era of knowledge and information and human resources are considered as the intellectual capital of any organization. Together they play a contributing role in producing innovative and competitive products, by utilizing abilities and experiences of resources (Sunassee & Sewry, 2003). KM plays a fundamental role in successfully transforming individual knowledge into organizational knowledge (Liebowitz, 2001) that results in organizational learning and success through innovation. Project managers need to find ways to manage the collective intellectual capital, since it is

a critical asset that differentiates organizations from its competitors (Liebowitz, 2000). Implementation of a KMS, however, does not come on its own without dedication from the top and the middle management, the data congregated from preceding projects will remain in its unrefined form (Pharhi, 2009).

KM plays a significant role in the success of any contemporary organization especially the project oriented organizations in which the nature of the new projects is similar to the projects done in the past, and where the lessons from past mistakes and successes are utilized in order to enhance efficiency and alleviate risks. A cognizant and prescribed implementation of the lessons learned process will ensure the organizations future success (Pharhi, 2009).

KM and Project Management (PM) are not only recognized to be of absolute significance for the competitive advantage of IT based organizations, but also a major driving force of change in the age of the knowledge economy. Most software projects fail or are challenged due to the lack of accessibility of right knowledge and information to the right people, at the right time, and further help them to share and extract knowledge and information in ways to improve their performance and deliver results that are required to improve projects overall performance (Al-Zayyat, Al-Khaldi, Tadros & Al-Edwan, 2009).

A quantitative research conducted to identify the relationship between the KM and PM practices in the IT industry of Jordan (in which 114 project management practitioners and some affiliated with the Project Management Institute (PMI)) indicated that there exists a positive relationship between the uses of KM practices in improving the management of the software projects (Al-Zayyat et al., 2009). Similar results were found in a research conducted in the Taiwan that was to study the effects of the implementation of ERP KM on enterprise operating performance improvement (Chen, Liu & Tsai, 2007). KM is of great importance when it comes to estimation since a lot of data is required to complete the task, quantities, rates, specifications and standards Etc. The data is itself meaningless, but after interpretation and application of the data to produce the estimates, it becomes information. This information is transformed in to knowledge after the addition of the basis of estimates, assumptions and exclusions (Ahmed, Ahmad, Ehsan, Mirza, Sarwar, 2010).

A validated KM framework has been presented in an investigative research conducted to explore the KM implementation strategies, indicating the importance of KM practices in the automobile industry of South Africa (Sunassee et al., 2003). Similar, research was conducted on a company in the United Kingdom, and the main objective was to identify, how the company developed their Knowledge Management System (KMS); its initiative, key elements and the implementation approach, in order to facilitate others to help establish KMS in reality, benefiting from the research outcomes (Wonga et al., 2006). According to an exploratory research on KM, the majority of the presented frameworks in the literature are dictatorial in nature (Metaxiotis et al., 2005).

RESEARCH METHODOLOGY

In order to identify the knowledge management framework and accompanying parameters that lead towards effective SPM, a longitudinal research has been conducted. The research has many variables and multiple truths. It is holistic, intuitive and subjective in nature. Analysis has been conducted though participative and collaborative inquiry of the research subject. Mainly qualitative analysis is used for overall research.

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Research Questions: Several research questions are answered during the course of research. The answers to the following support questions have been identified via literature review and available research:

1. What is knowledge management?
2. What is knowledge creation and usage?
3. What are different models for creation and usage?

The following core questions have been answered via qualitative analysis:

4. How knowledge creation and usage helps in effective SPM?
5. What are the different KM models that help improve effectiveness of SPM by targeting knowledge creation and usage?
6. How software projects can be managed effectively using KM models for knowledge creation and usage?

In order to answer question no. 6, following are the sub questions the need to be answered:

   a. What is the proposed model?
   b. What are the bases of construction of this model?
   c. What are the test results of this model?

Part c. of question no. 6 is addresses in a pilot study (conducted over a period of time), to test the outcomes of the suggested framework.

Data for this research has been gathered via primary research, journal, papers and books. Further the data was collected by conducting structured interviews, field study, focus groups and ethnography. Structured interviews were composed of live interviews with project managers, development managers, project leads and team leads, by asking open ended questions, and recording their experiences. Data has been collected from 16 major companies belonging to the IT and services sector. Data has been analyzed by interpreting the recorded interviews qualitatively. A problem faced during the interviews was that some interviewees' were presenting themselves in the best possible light, giving desirable rather than actual and honest insight of organizational practices.

RESEARCH RESULTS

The application of KM practices in the software industry of Pakistan is slightly different from what is being done internationally. Most of the organizations use number of knowledge and information management practices to facilitate their organizations with the concept of KM and to organize the flow of information and knowledge. These findings are the answer to the questions listed in the "Survey Questions" section of this paper.
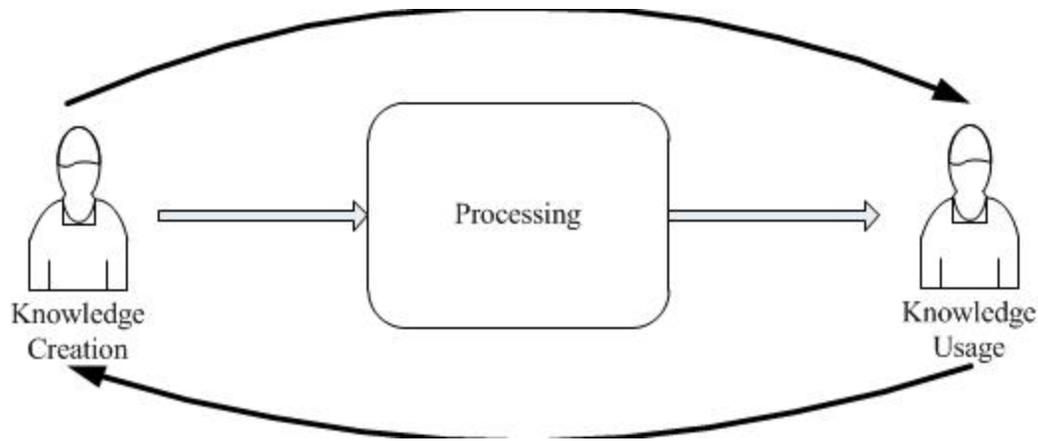
Figure 1: Basis of Knowledge Creation and Usage

Figure 1, shows the very basis of knowledge creation and usage, in a KM environment. The findings and analysis of the interviews are as follows:

KNOWLEDGE MANAGEMENT PRACTICES

Software organizations in Pakistan make use of knowledge management practices without knowing what they are doing. Every organization has a mechanism for managing the flow of information and knowledge inside and outside the organization. Some have explicit understanding of KM and have named their practices as Knowledge Center (KC), Knowledge Base (KB), Etc, and some organizations have different KM practices for different clients in order to coupe up with their project requirement and customer expectations. KM practices found during the research are as follows:

- Knowledge Centers (KC): Some organizations make use of knowledge centers (KC) to effectively fulfill their KM requirements. The main idea of establishing practices like KC is to provide a platform to the employees to post queries, share experiences discuss ideas, discuss solution to problems, experiences from lessons learned from projects, post videos, training materials Etc, by making it available to all the resources of the organization world wide via the internet and successfully transforming individual knowledge into organizational knowledge.
- Knowledge Base (KB): Knowledge base is also a KM practice and can be considered as a variant of KC with rather reduced features. Through KB employees share articles, discuss problems, provide solutions and rate the information they like.
- Knowledge Communities: In multinational organization there is concept of communities, where employees can initiate or contribute to discussions related to the organization. Discussions related to new technology, products, projects, issues and processes is conducted within communities.
- Sharing Best Practices: Majority of the interviewed organizations have mechanisms of sharing their best practices. Professional experiences, solution to problems, project experiences Etc, are shared by employees on SharePoint portals, accessible to all the employees in the organization. Almost 70% of the interviewed organizations make use of SharePoint Portals for this purpose.
- Focus Groups (FG): FG is a form of qualitative research and are created to give their opinion on assigned tasks based on facts. The outcome of the work done by the FG's in the form of

work products are maintained and distributed within the respective stakeholders to assist their strategic decision making.

- Audits Inventory: Almost all organizations perform audits in order to perform gap analysis of their existing practices with any selected industry standard. Planned and unplanned audits are performed in almost all organizations. All audit related work products are placed on a central repository for future reference and improvement.
- Online Helpdesk: Online helpdesks or help forums are provided by almost all the organizations to their client / customers, to give their valuable feedback. Users of helpdesks can post issues, queries, new requirements, and suggestions Etc on the helpdesk. Helpdesks help in managing and tracking of customer related queries, and are one of the most frequently used KM practices
- Configuration Management System (CMS): To perform configuration management of the projects, Configurations Management System (CMS) is used to establish and maintain the integrity of all the work products of the project. Every organization has a CMS e.g. Team Foundation Server, Visual Source Safe, CVS, Sub-Version (SVN) Etc.
- Project Management Solutions: Project managers make use of different project management solutions in order to assist their project management activities like; resources, scope, time and cost management. Some commonly used project management solutions include, MS Project Server 2003, MS Project 2003, MS Project 2007, MS Excel Etc. Other open source project management solutions include PMS and open source solution used for managing, controlling and monitoring the projects.
- Requirement Management Solutions: Organizations working on open source technologies have frequently been found using requirements management tools like JIRA, for managing requirement from the start of the project till the end. This helps them in tracking customer requirements with design, technical requirements and bugs.
- Bug / Issue Tracking Systems: Almost every organization has a bug / issue tracking system in place to track the bugs within projects. These trackers are used to track, manage and monitor the bugs / issues from their birth till closure. Some commonly used bug trackers are BugTracker.Net, MantisBT, Bugzilla, HP Quality Center, Team Foundation Server (TFS), JIRA Etc.

The following lists some of the common KM practices used in Pakistan software industry:

- Focus Groups
- Dashboards
- Helpdesk
- Content Management System
- Knowledge Communities
- Knowledge Base
- Software Wiki
- Quality Center
- Team/Group Sites
- Bug Trackers
- Discussion Forums
- Email Clients
- SharePoint Portals
- Knowledge Management Tools
- Requirement Management Tools

Journal of Strategy and Performance Management, Volume 2, Issue 1, January 2014.

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KNOWLEDGE MANAGEMENT SOURCES

Research in Pakistan has revealed that there is a human centric approach behind the sources of KM, sources of information varies from organization to organization. Some common sources of information are as follows:

- Project Managers: Information maintained by the project managers during the course of the project related to resources, scheduling, costing, monitoring and control serves as a part of the organizational KM.
- Audits: Planned and unplanned audits results in many work products that are used to improve the deficiencies in specific and in general. Audit results are managed and controlled for further use and future reference.
- Team / Architectural / Customer Meetings: Team meetings are logged in the form of meeting minutes and are placed on CMS or SharePoint site. In case of virtual teams, meetings are normally done via video conferencing. The recordings of these meetings are also placed on CMS under the respective project or on SharePoint site.
- Emails: Emails from customers or any other project stakeholders are placed on a central location (as evidence) for future reference.
- Phone Calls: Phone calls are recorded and placed on a central location like TFS or SharePoint Site.
- Employees: Employees are the main source of knowledge in all the organization under study. They are the main contributors of intellect to KMS.
- Customer Support Team: Issues communicated by the customer are logged in to the KMS i.e. Helpdesk.

KNOWLEDGE MANAGEMENT - ACHIEVED RESULTS

According to the interviewees, earlier they faced a problem that knowledge was there but it was scattered but now KM has not only managed the flow of information but has also resulted in establishing an organization wide learning culture in software organizations, as shown in Figure 2.
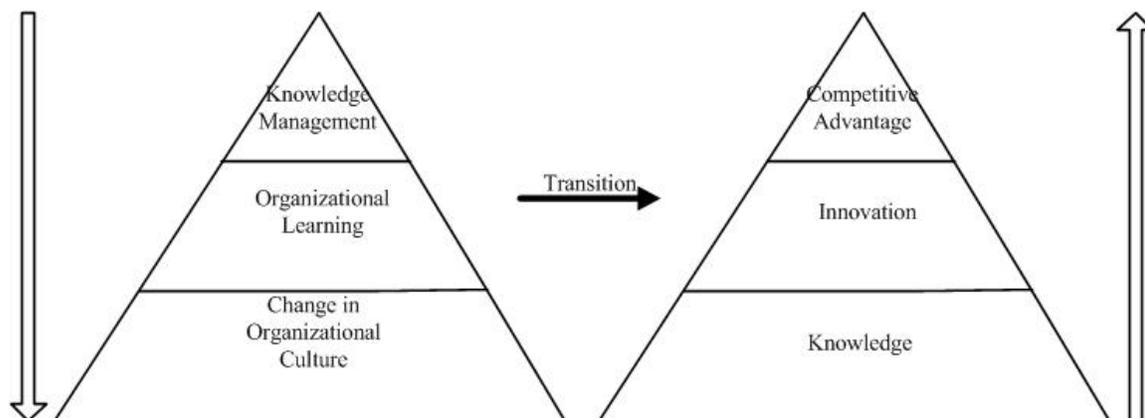

Figure 2: Development of Organizational Learning Culture through KM

Other achieved results of using KM practices as indicated by the interviewees are as follows:

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- Improved Project Management: KM practices help project managers in resource management and provide more timely, accurate and transparent information about the current state of the project. The intellectual capital of the organization can better be utilized by the project manager for the betterment of the project. Similarly, change management is more effective, timely and cost effective in a managed KM environment.
- Virtual Teams: Almost all interviewed organizations have resources working at distributed locations. Virtual team members can access the KMS online, and can contribute to the overall success of the organization. In case of virtual teams the best practice is weekly meetings, and all the stakeholders of the team / virtual team are involved in it. These meetings are very helpful in letting other team members understand the kind of problems that are being faced by the project team members and if the proceedings of the meetings are documented / recorded or not. Best utilization of a virtual team member is when teams have different time zones. For example a virtual team member in USA interacting with customer posts some enhancements on the online KMS in case if the enhancements are implement able in a day. The patch is delivered to the client the very next day. When the client wakes up next morning and comes to the office they have the new patch with new features implemented.
- Project Tracking & Management: SharePoint sites or Google Sites are linked with project management tools making use of MS Excel, helps in tracking and managing the projects online, giving the managers and top managers the exact snapshot of the project.
- Customer Satisfaction: Introduction of KM practices results in improved customer satisfaction. Consider an example in which customer has posted an issue on helpdesk, an email is generated to all concerned stakeholders who will resolve the issue if it can be resolved immediately, else, it will be delivered in a later Patch. Due to the introduction of an online helpdesk; customer queries are answered in timely manner resulting in customer satisfaction.
- Improved Product Quality: Project status can be viewed by the CEO and all the relevant stakeholders online in the form of a Dashboard. Using Google Sites functionality; everyone can view the number of bugs assigned to individual developer as well as the number of number of bugs identified by the customer. In order to avoid this situation developers make sure that they write quality code and in return a clean build is delivered to the tester who ensures that all possible scenarios are covered before the release is delivered to the customer.
- Sharing Mechanism: Improvement in mechanism of knowledge and information sharing has occurred due to KM incorporation since previously with no KM practices knowledge and information was scattered and unmanaged.
- Reduced Rework: Consider an example. If a team has worked on a new technology, and it has placed its findings on KMS, then in future other teams do not have to work from scratch on that technology, instead they will refer to KMS to avoid rework and make use of reusability. Similarly, if a team started working on .Net 4.0 Beta for evaluation purposes; they placed all their findings on KMS. Now in future if someone has to work in WPF (Workflow Presentation Framework) then they can simply refer to KMS to fulfill their needs.
- Helps in Trainings: KM practices helps in training new resources. New resources are provided the links to the online sites e.g. Helpdesk, Bugs Tracking System, Knowledge Center Etc. New resources can get the best understanding of the software applications and domain understanding from bugs and customer related issues.

KNOWLEDGE MANAGEMENT & SOFTWARE PROJECT MANAGEMENT

KM practices are already playing a direct role in helping the PM's in managing the software projects effectively and performing the project management functions efficiently. Similarly, the KM is also playing an indirect role in the overall success of the organization, by impacting some of the contributing factors e.g. trainings, processes' maturity, employees' intellect, customer satisfaction, project management activities, code management, documents management, resource management, creativity and innovation Etc by introducing KM practices like for example Knowledge Communities, Software Wiki, Knowledge Base, Knowledge Centers, Helpdesks, Focus Groups, Discussion Forums, SharePoint Portals, Project Dashboards, Quality Center, Configuration Management Systems (like TFS, VSS, CVS, SVN), Project Management Tools (like MS Project, Primavera) and Requirements Management Tools (like JIRA) Etc.

- Planning: KM practices helps a PM and the project team in reducing rework and minimizing the time that is taken in planning the projects. Utilizing the information available in the organizations, KMS allows greater control over the project throughout the project's execution by reducing planning risks.
- Estimation: Most of the project managers use analogy approach to do estimation. According to a project manager, as they prepare estimates of projects, they require lots of data in order to complete the task of estimation. This data normally includes, lessons learned, estimation sheets of old projects, resource sheets, work / task details or work breakdown structure (WBS) according to PMBOK, in order to perform the task of estimation effectively and efficiently. The estimation involves time, resource and cost estimates, and most of the time it becomes a tedious task to gather or look for the required data for the purpose of estimation from distributed / scattered locations. With a KMS in place the project managers can acquire all the required data from one single platform.
- Time, Cost & Resource Management: KM helps the project managers a great deal in the management of time, cost and resources of their projects. PMs make use of the historical data available in the KMS for effective time, cost and resource planning, for similar projects done in that past. MS Project is the best project management tool that project managers use for managing the triple constraint of their projects. By making use of project management tools as part of the KM practices, project managers manage the triple constraints in variety of ways; variance analysis, base lining, resource leveling, resource sheets, cost variance, schedule variance Etc.
  Project managers benefit from the use of KM in the management of resources for their projects (human resource management (HRM) and project resource management). Majority of the organizations have human resource management systems for managing the organizational resources. Similarly, PMs make use of MS Project for managing the resources allocated to their projects. Those who do not use project management tools manage their resources using MS Excel and open source project management solutions like JIRA. PMs can easily view the status of every project resource at a glance using the respective project management tool. However, majority of the PMs, Project Leads (PL), Team Leads (TL) and senior management officials do not utilize the full capabilities of the resource management features provided by the project management tool they use.

- Scope Management: Ways of managing the scope of the project varies from organization to organization and from project to project, but the core concept that is to manage the scope (i.e. adequate management of requirements of the project) remains the same. The collected

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requirements are documented in the form of a formal requirements document, using word processing software or excel sheets and are managed and controlled using CMS. Along with the requirements documents for bigger projects with time span greater than 3 months, requirements management plan and requirements traceability documents are also maintained and controlled over the CMS. In general the requirements management is found to be the responsibility of the PM for effective scope management of the project. However, in some organizations, for large projects, Business Analyst (BA) or Requirement Manager (RM) is designated for the purpose of collecting and managing the requirements. The work products produced as an outcome of the requirements management are managed and controlled over the CMS for further use and reference. In some organizations that are work with open source technologies JIRA is used for managing requirements.

- Project Execution: KM practices help in managing the work products of the execution phase of the software projects, by managing the work products of all the phases of the software development life cycle (SDLC). Almost all organizations use CMS for managing the work products and deliverables of the projects created during the entire SDLC. Some of the CMS that are part of the organizational KM are; Microsoft Visual Source Safe (VSS), Microsoft Team Foundation Server (TFS), CVS, Sub-version (SVN) Etc.

- Monitoring and Control: The overall function of the PM is to harmonize the project through out the entire project life cycle, by performing monitoring and control (M&C) and by using measurement and analysis (M&A) in order to meet the overall project objectives. M&C can be effectively done by utilizing the information of projects done in the past, available on the KMS. Similarly, results of the M&A of the project are kept on the respective KMS for future use by the PM. Consider the example of organizations using Microsoft Team Foundation Server (TFS) for managing the configuration of all the project related work products. PM can easily monitor and control the projects' performance using the project management solutions by analyzing the cost and time variance. PMs can perform M&C practices more effectively and efficiently (including document control, version control, cost control, resource monitoring, work performance information analysis, schedule control in specific and project control in general).

- Quality Management: KM practices impact the quality of the work performed by the quality team. KM affects general quality management and improvement of products, projects, processes and people within organization.

- Quality Culture: Establishing a quality culture is a difficult task and it can only be done once employees start following the defined standards. Such culture can be established by sharing the best practices of work, customer scenarios, and experiences on the KMS.

- Trainings: Using KMS PMs do not have to worry about the training of new resource. PMs can get benefit from the KMS by going through the available information. KMS gives them precise information about the project and solution to the problems that are generally faced, and the nature of the work being done in the organization. Some organizations practice this approach for training new resources for few weeks.

- Improved Project Management Expertise: Inexperienced PMs can also learn or guide themselves from the experiences of other PMs who have worked in the same area. This is only possible once all the information and knowledge is available and accessible through one platform.

BENEFITS OF IMPLEMENTING KM

This research has unfolded number of benefits associated with the use of KM practices in the IT industry of Pakistan, and the span of these benefits will increase with the passage of time and maturity

in the use and implementation of the KM practices. Below are some of the listed benefits, which is the crux of the analysis:

- Improved management of software projects
- Improved, managed, efficient and easy access to information and knowledge
- Utilization of intellectual capital
- Improved software costing
- Improved problem solving time
- Effective resource management
- Better time management
- Management of organizations intellectual assets
- Efficient resolution of problems
- Improved productivity and efficiency of resources
- Improved product, project and process quality
- Sharing of new ideas, creativity and innovation
- Organizational competitiveness through innovation
- Learning and training opportunities
- Enhanced collaboration and coordination between individual and teams
- Effective and efficient change management

INTEGRATED ORGANIZATIONAL KNOWLEDGE MANAGEMENT FRAMEWORK (IOKMF)

Software organizations in Pakistan are making use of several KM practices to achieve their desired goals of KM. Though; knowledge is managed but it is still scattered and available at different databases. According to the interview results, the organizations practicing KM, desire to improve or switch to a new practice if it satisfies their KM needs better than the existing practices. Consider an example as quoted by one of the managers; "When we use a system we get to know the pros and cons of the system with the passage of time, and we will only switch to a new KM platform if the problems are well addressed in it. If our KM process is stable and we are already achieving the expected results then it is useless to shift to a new KM platform."

The characteristics of a suggested framework for knowledge creation and usage, IOKMF, are as follows; the following characteristics have been identified based on the interview discussions and literature review:

- One platform
- Web based
- Project Dashboard for every project
- Dedicated team to manage KMS
- All KM practices should be available on one platform
- Accessible to all the employees of the organization
- Roles management at individual level
- Should have reports to analyze the effective use of knowledge and best practices
- Rating criteria for available knowledge
- Repository management for all type of project, product and organization data
- Discussion forums

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- Knowledge Communities
- Issue/Bugs Management
- Tasks Management
- Above all there should be a defined procedure for the usage of KM practices within an organization
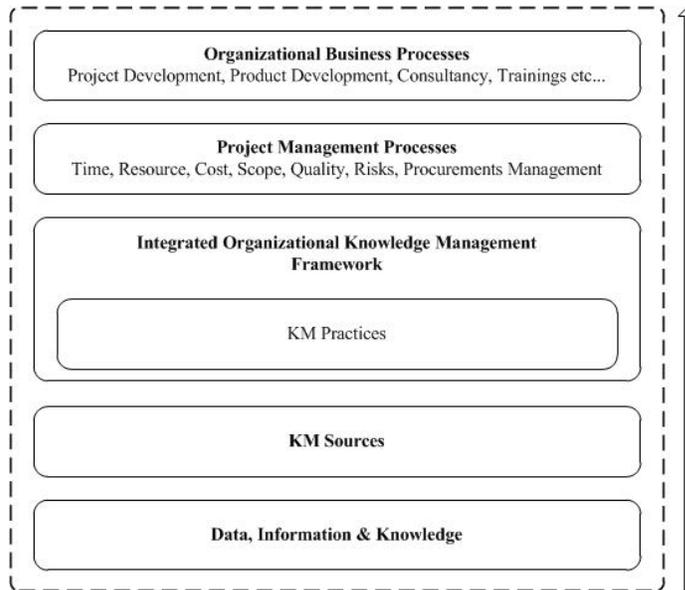

Figure 3: A Suggested Layered Architecture on which IOKMF (KMS) is to be built

The knowledge available on KMS involves the process of creation, processing, and usage of information and knowledge to create and sustain a competitive advantage. Figure 3 shows a layered architecture of the flow of data, information and knowledge in an organization in which IOKMF is to be used. The data, information and knowledge are fed into the KMS via variety of sources using variety of KM practices. The core concept is to provide a single platform for the creation and usage of knowledge across the entire organization in a distributed environment. The PM's can make use of the data, information and knowledge available on IOKMF in order to perform their project management activities such as time, resource, cost, scope, quality, risk and procurement management Etc. This in turn will help in stabilizing the organizational business process to attain a competitive advantage in the IT industry, by supporting and creating and organization wide learning culture. Figure 4, shows a conceptual framework of the, "Integrated Organizational Knowledge Management Framework" that has been suggested and tested based on the research outcomes and KM needs of the IT industry of Pakistan. IOKMF has been partially implemented in selected organizations in Pakistan and results have been captured. Overall affect is minimization of rework, increased productivity, quality, efficiency and effectiveness. It can be easily said that IOKMF indirectly contributes to enhanced return on investment.
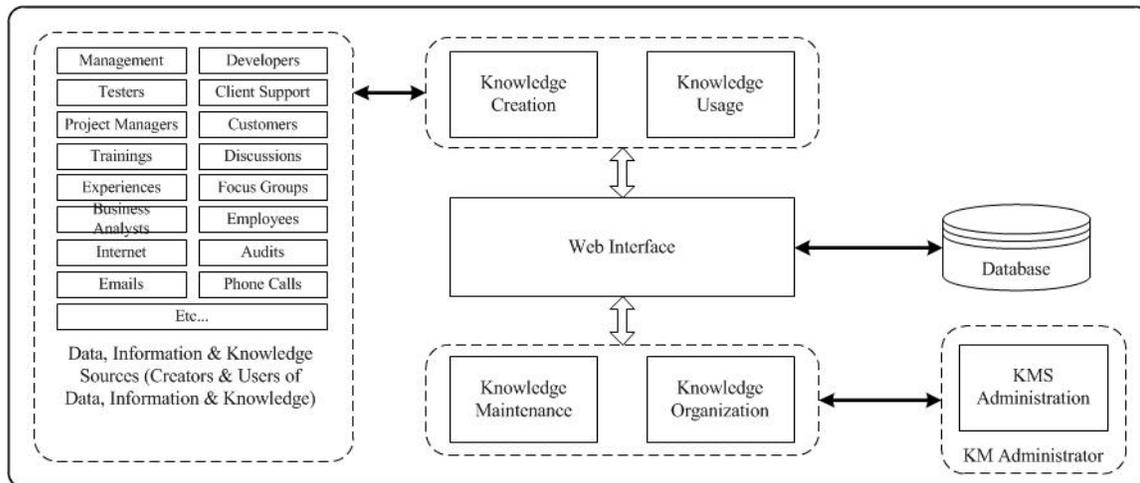
Figure 4: Integrated Organization Knowledge Management Framework (IOKMF)

CONCLUSION

In the next few years; thoughts, ideas and needs that have harvested in the minds of the software industry gurus will serve as beacons for young software engineers, steering them to devise databases of information and knowledge that is almost built itself. Software organizations in Pakistan are making use of knowledge management practices to facilitate their knowledge management needs. This in return is having a direct impact on the project management practices of the PMs. KM practices are also playing an indirect role in the overall success of the organization, by impacting some core factors such as trainings, processes maturity, employees' intellect, customer satisfaction, project management activities, code management, documents management, resource management, creativity and innovation Etc and by introducing KM practices like for example Knowledge Communities, Software Wiki, Knowledge Base, Knowledge Centers, Helpdesks, Focus Groups, Discussion Forums, SharePoint Portals, Project Dashboards, Quality Center, Configuration Management Systems (like TFS, VSS, CVS, SVN Etc) and Project Management Tools like MS Project, Primavera, and Requirements Management Tools like JIRA Etc.

Collectively KM practices and sources are playing a contributing role in helping not only the PMs but almost all the stakeholders of the project in specific and organization in general. It can be concluded that KMS provides better ways for creation and usage of knowledge that is originally scattered and distributed in an unmanaged and intangible form, making it intellectually intangible for organizational resources.

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