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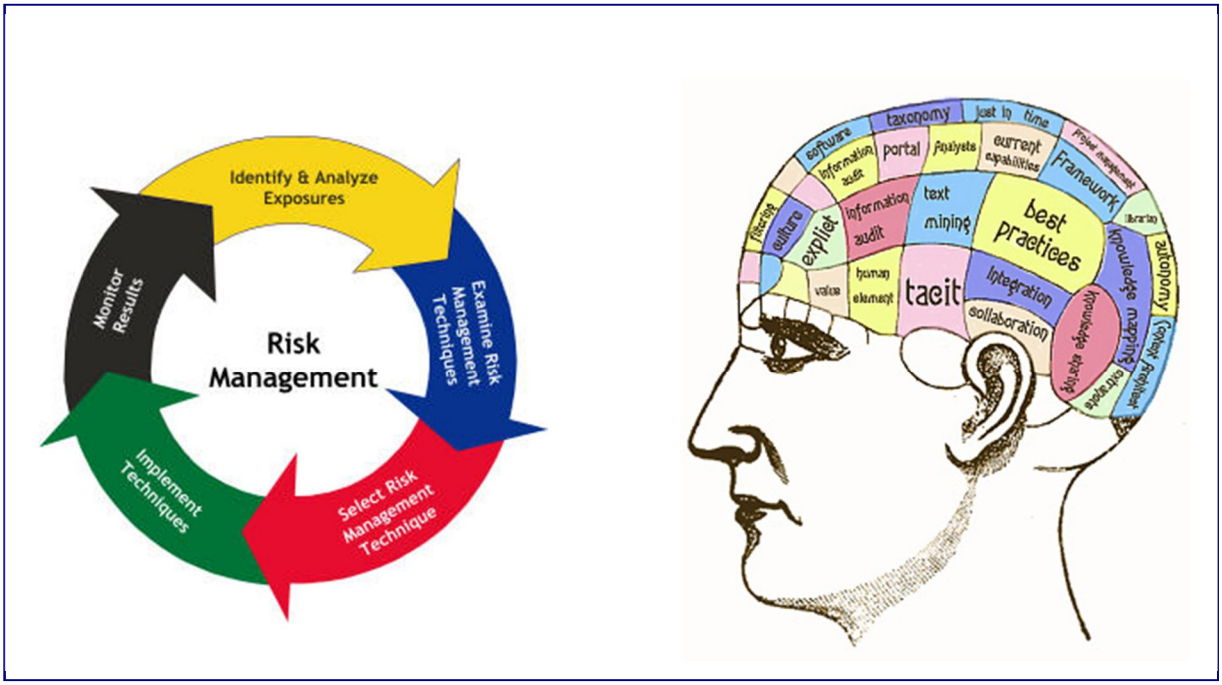

Use of Knowledge Management techniques for Risk Management

Application at the Initial Project Stages

Master of Science Thesis in the Master's Programme International Project Management

GAGANDEEP SINGH

Department of Civil and Environmental Engineering
CHALMERS UNIVERSITY OF TECHNOLOGY
Göteborg, Sweden 2012
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Table of Contents

List of Acronyms

APM	-	Association for Project Management
APMBOK	-	APM Body of Knowledge
CKO	-	Chief Knowledge Officer
COP	-	Communities of Practice
DMS	-	Document Management Systems
DSS	-	Decision Support Systems
EL	-	Expertise Locator
FAQ	-	Frequently Asked Questions
IM	-	Information Management
ICT	-	Information and Communications Technology
ISO	-	International Organization for Standardization
KM	-	Knowledge Management
KMS	-	Knowledge Management Systems
OECD	-	Organisation for Economic Co-operation and Development
PESTEL	-	Political, Environmental, Social, Technical, Economic, Legal
PM	-	Project Management
PMBOK	-	Project Management Body of Knowledge
PRM	-	Project Risk Management
RBS	-	Risk Breakdown Structure
RM	-	Risk Management
SWOT	-	Strengths, Weaknesses, Opportunities, Threats
UN	-	United Nations
UNESCO	-	United Nations Educational, Scientific and Cultural Organization
UNO	-	United Nations Organization
WHO	-	World Health Organization

List of Illustrations

Abstract

Purpose – The purpose of this M.Sc. dissertation is to review the approaches of Risk Management (RM) and Knowledge Management (KM) and analyse how these two distinct domains of Project Management can be combined to achieve benefits in the early stages of the project.

Design/methodology/approach – Initially a comprehensive review of the Risk and Knowledge Management literatures was conducted. This was followed by a review of the reports of international organizations such as WHO, UN and others in order to create a framework. This framework was complemented and further verified by the primary collection of data in the form of interviews with project managers from diverse industries. With focus on the initial stage of the project, the risks that threaten the project right from the beginning were established. With the clarification of risks, the tools and techniques of RM being used were examined followed by the examination of the commonalities between RM and KM.

Practical implications – This study has explored insights into how using KM tools and techniques can develop the implementation of RM. The findings of the study are applicable to all the project organizations utilizing KM and RM. Moreover, the findings can be further developed to conceptualize novel processes and tools for KM and RM integration by the academic world in the form a detailed research through collaboration with the university researchers and management professionals.

Originality/Value – The research represents one of the first attempts to find similarities between these two domains of PM and how they can be combined and takes the research of PM one step further thus paving path for future studies.

Keywords – Project Management, Knowledge Management, Information Management, Risk Management, International organizations, Information, Knowledge, and Risks.

Chapter-1

Introduction

This chapter introduces the theme of the research. For this, the background on which the issue arose is presented first. This is followed by the scope which defines the aims and objectives for the study. The last section describes the structure of the M.Sc. dissertation illustrating the way in which it is laid out as chapters and sections within.

1.1 Background:

Organizations operate in a web of risks which span from the cluster of natural catastrophes, failures related to human acts, breach of security, financial turmoil, unsteady business environments and project failures. The high rates of failure of projects can be reduced if risks are mitigated or managed in an appropriate manner. Most of the research on risk till date has been focussed on dealing with the threats rather than on the impending positive gains. This is unfortunate as it leads to a narrow vision and admiration of project uncertainty (Chapman & Ward, 2003).

A capital investment paradigm dominates the pre-project stage influencing the structure and analysis of decisions (Woodhead, 2000). As a consequence, the cost element dominates other factors leading to less emphasis and ignorance of other issues that could potentially originate risks. But this is only one aspect of Risk Management (RM) which as a divergent domain assimilates knowledge from varied project settings to apply practices to solve specific problematic areas (Alhawaria, Karadshehb, Taletc, & Mansoura, 2011).

With the increasing size of organizations and aggregating complexity, the necessity for the effective and efficient management of knowledge becomes critical (OECD, 2004). As a consequence, Knowledge Management (KM) has received significant attention in the literature (Spender, 2006). On the face of it there is significant overlap between KM and RM but very few authors have utilized KM principles in the RM process. Therefore there is a vast area between these two aspects of PM which is still grey and is in its evolution stages.

Risks emerge due to the presence of uncertainty. Uncertainty in any environment originates as a result of lack of information. In projects, the decisions have to be made even in this context which leads to the origin of risks. These risks can be transformed into potential benefits or left to become threats depending on the way the knowledge is utilized to convert information available with the passage of time. As the complexity and steps for the processes and procedures for a task increase, it becomes necessary to possess appropriate and precise knowledge for responding appropriately and taking the optimum decisions (Alhawaria, et al., 2011). Feeding appropriate information in to the processes leads to the formation of augmented solutions. Additionally, as a result of the autonomy possessed by the project, they

have the disadvantage of getting untied from the rest of the projects thus leading to alienation at the knowledge front (Koskinen, 2010).

The knowledge of the project is dependent on the interpretation of information and data that can change the whole scenario. The transmission of assumptions, interpretations, and knowledge has to be carried out from the sponsors, project managers and project team's mind to the tools of risk register and others. Moreover, the values and experience of individuals influences the decision making process due to which subjectivity arises (Woodhead, 2000). This forms the basis for the preliminary estimates at the initial stages of the project rather than the information that can be assessed. As this is not very precise, it becomes the breeding point of risks from where all subsequent estimates are based upon. KM plays a pivotal role in this situation to ensure an effective RM process by providing the context and learning possibilities. This enables RM not only to manage risks but in turn to deal with the entire context adjoining the risks for effective understanding and mitigation (Emblemsvåg, 2010).

1.2 Aim:

The aim of this research is:

To explore the extent to which the tools and techniques of Knowledge Management are applicable to the processes and procedures of Risk Management used in the early stages of projects.

This further investigates whether they can be effectively implemented in order to improve current RM practices.

1.3 Objectives:

For the realization of the aim, the objectives for research were defined. These are as follows:

1) To identify the sources of risks present in the early project stages
2) To identify and examine the tools and techniques of KM which can be used in the early project stages
3) To explore the similarities between KM and RM tools and the conditions under which the KM techniques can be applied to RM

4) To analyse the means of improving the tools and techniques of RM used in the early project stages by utilizing the strategies and approaches of KM

1.4 Scope:

This research takes the issue of project failure due to inappropriate management of risks into account to explore the risks which threaten the project right from the formation stage. This is accomplished by viewing this context from the KM lens. This is grounded on the fact that many projects face failure as a result of the dearth of knowledge among the project stakeholders or lack of information sharing as the project progresses (Alhawaria, et al., 2011).

One of the novel and significant areas of research that has not been explored in-depth hitherto is the employment of KM processes for the facilitation of the application of RM processes (Alhawaria, et al., 2011). This forms the theme of this research. The traditional PM approaches concentrate on regular sources of risk, a project's outcome cannot be satisfactorily predicted if risk areas related to the utilization of information are not identified and analysed. Through the conception and diffusion of knowledge, the organization's value as well as its capability is enhanced to respond to new and unusual situations which can otherwise lead to the formation of risks (Choi, Poon, & Davis, 2006). Moreover, the application of a knowledge-based approach has the potential for refining the capabilities and services of the risk managers (Alhawaria, et al., 2011).

The study takes up the above mentioned issues within the project context in the early stages when the project scope and stakeholder expectations are being defined. It is at this stage when a lot of information is available but can be lost if not managed appropriately. So the scope of the study was confined to the early stages with a detailed analysis of the risks and their management through the utilization of the KM resources in the form of skills, tools, techniques and approaches.

1.5 Research Method

The research is primarily a desk-based study with a qualitative focus. The study was completed in two phases, which include the primary research and the secondary research. In the first phase a literature review was conducted summarizing the key areas of the Knowledge and Risk Management literatures. This was then followed by a review of official

reports published by large international organisations. The findings from the first phase were then tested and further developed in the second phase by a series of interviews with experienced practitioners working in a variety of industries. The research process was accomplished in four steps which are described in Methodology Chapter-4. All the information gathered was then analysed and the outcomes are presented in the discussion section followed by the final conclusion.

1.6 Research Limitations

Due to time restriction, the boundaries of the research have been limited to the study of only the early stages of the project. The secondary research is applicable to all of the stages but the primary data collected and issues studied in interviews pertain to only the early stages. So the study paves way for the investigation of other stages which are the execution and implementation stages of the project.

1.7 Structure and Organization of the research

The study followed progressive steps, planned along the objectives which are interrelated, with the control factor being that the analysis of any objective necessitated the fulfilment of the preceding one.

Chapter-2 initiates the literature review leading to an understanding of the KM domain, its tools and approaches which are then used for the analysis and discussion further in the dissertation. This is provided by throwing light on the history and background first, followed by defining the knowledge conversion process. The KM concept is then introduced followed by its categorization, domains and techniques. The last sections describe the role of technology in KM and its practical application aspects.

Chapter-3 provides an overview of RM with its literature review which forms the basis for analysis. This is provided by reviewing the history and background first, followed by the classification of the risks. The chapter then explains the difference between uncertainty and risk. Finally the RM process and the techniques are described in brief followed by the last section which describes the constraints faced by RM.

Chapter-4 provides the detailed structure and methodology which was followed for data collection and research. This is described in terms of the research design and the process followed for it followed by the justification of using interviews as primary data collection tool. The last segment describes the data processing and analysis methodology used.

Chapter-5 provides the analysis of the information gathered for the purpose of research. This is first prepared for the secondary research, which forms the framework for the primary research, the interviews of which gathered information which is then examined. This chapter forms the base on which the discussion is established.

Chapter-6 utilizes the analysed content from the previous chapter and provides a discussion of the issue leading to the fulfilment of the research objectives. This follows the objectives of the research which are dependent on each other and thus follow a sequence. The first objective is analysed in Chapter-5, this chapter takes the discussion further examining the remaining three objectives.

Chapter-7 concludes the findings of the research while defining the scope for future study. This is placed into sections which describe the study by describing the aim and objectives accomplished, the practical implications of the study, the limitations and the recommendations for further studies in the field.

Chapter-2

Knowledge Management Literature Review

This chapter provides a review of the KM literature. This is delivered by throwing light on the history and background first. This is followed by the classification of the basic concept into segments and then defining the knowledge conversion process. The KM concept is then introduced followed by its categorization, domains and techniques. Finally, the last sections describe the role of technology in KM and its practical application aspects.

2.1 Background and history:

With the transfer of knowledge becoming more complex and widely discussed, by the 1970s, management theorists were labelling information and knowledge as 'organizational resources' (Drucker, 1977). In the 1980s knowledge in its context as well as a term in itself was being considered as a competitive asset in the professional world. The academic domain then followed and acknowledged its existence and numerous articles and books related to knowledge and its management started appearing. By the 1990s the context of knowledge started to shift from the individual level to the organizational level with the notions of 'learning organization' (Senge, 1990), strategies for managing knowledge (Leonard-Barton, 1995) coming into existence. In the late 1990s, KM was an in-thing and became a relevant business for management consultancies. The prominent aspect was the apparent shift from a focus on the individual's incremental and adaptive learning leading to recognition in the early 1990s to the added value achieved from action centred approach (Pun & Nathai-Balkissoon, 2011) to enhance learning for the individual as well as for the organization and its culture to achieve competitive advantage.

2.2 Classification:

Before proceeding further into KM, it is essential to clarify the distinct terms data, information, knowledge and wisdom. Data is raw with no meaning and significance beyond its existence (Kothari, 2004). Information is the processed form of data which carries meaning (Bellinger, et al., 2004). Knowledge is defined as the awareness or understanding gained by interpretative combining of data, information and experience (WebFinance, 2012). In brief, knowledge is data and information put into a certain context. In layman terms, information is understood as something codified and knowledge as tacit. Wisdom is the ultimate terminus and is the evaluated and refined blend of experience and knowledge. Figure 2.1 explains the transformational relation between these terms.

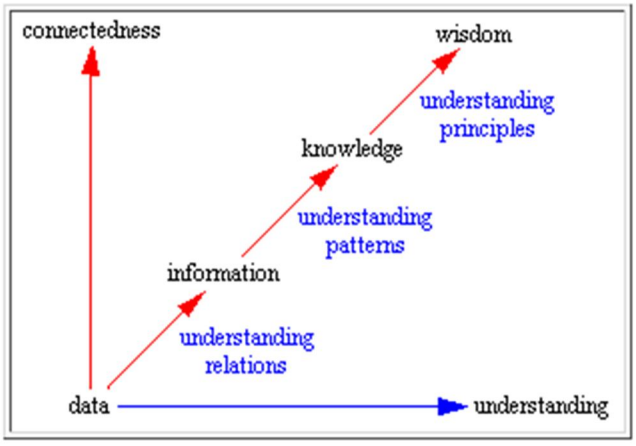

Figure 2.1: Intellect Transition: (Bellinger, et al., 2004)

Ikujiro Nonaka and Hirotaka Takeuchi contributed to the field of knowledge by introducing the understanding and categorization of knowledge. They classified knowledge into two categories namely: Explicit and Tacit, which forms the basis of KM in apprehending the role played by the information systems and the human systems. Explicit knowledge is the one which can be captured and stored in the form of documents for record purposes (Nonaka & Takeuchi, 1995). It is also called the 'hard' aspect of knowledge and is usually independent of the context. This by nature is representational and can be modified or changed as per use to enhance its range of value. Its transformational process takes place by converting the knowledge into information and then information into data. Tacit knowledge by nature resides in the intellect of the beholder which can be an individual or a group (Nonaka & Takeuchi, 1995). As it is based on experience and wisdom, it is not possible to record it. It is also known as the 'soft' aspect of knowledge and is usually embedded in the context.

2.3 Knowledge loop:

The Nonaka and Takeuchi spiral of knowledge creation essentially describes the process of knowledge transformation from one kind to the other as shown in Figure 2.2.

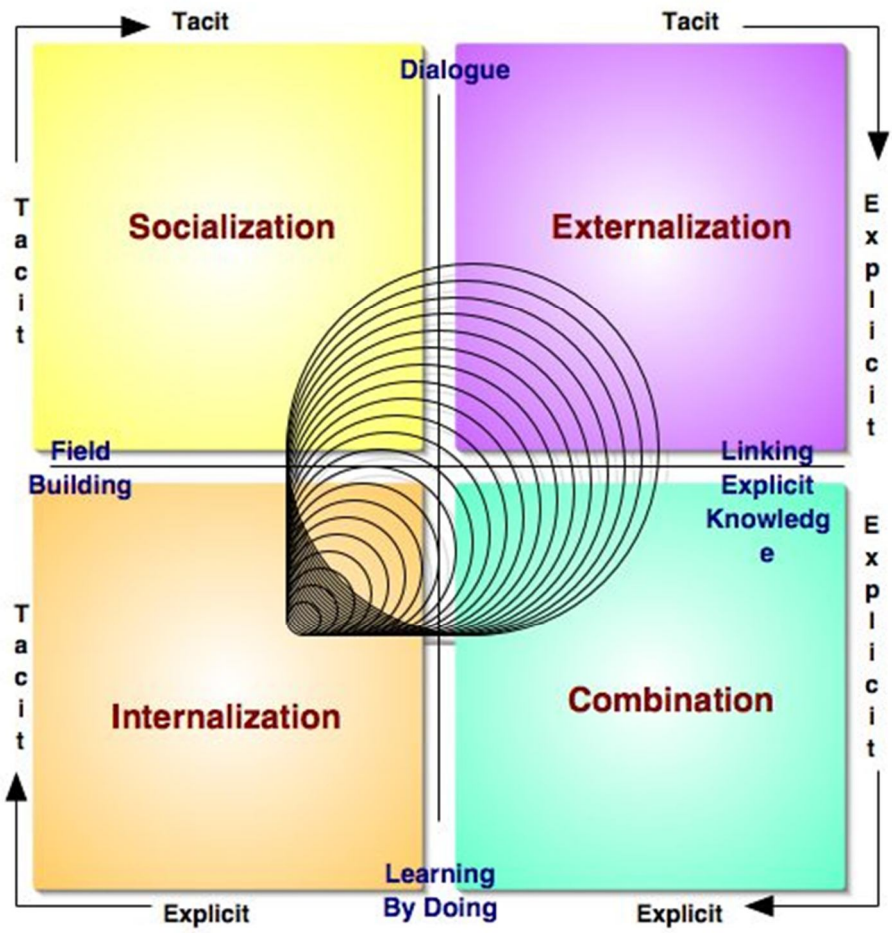

Figure 2.2: Spiral of Knowledge creation: (Nonaka & Takeuchi, 1995, p. 130)

The steps of this process are briefly explained in the following points:

1) Socialization (tacit to tacit) - *sharing experience via direct conveyance*

This process pertains to the creation through exchange of tacit knowledge, which is rather resilient to codification, by socialized interaction. This involves utilizing 'mental models' (Nonaka & Takeuchi, 1995) to socially transfer sympathized know-how to gain mutual understanding by way of face-to-face communication.

2) Externalization (tacit to explicit) - *articulating tacit knowledge into explicit concepts*

This process relates to the deployment of models, analogies, concepts, hypotheses and metaphors (Nonaka & Takeuchi, 1995) to rationalize tacit knowledge into formal models. It mediates to extract, model and synthesize tacit knowledge to offer it a visible form.

3) Combination (explicit to explicit) - *structuring conceptions into knowledge system*
This process through arrangement and sorting manipulates 'explicit systemic knowledge' (Nonaka & Takeuchi, 1995) to integrate the elements together to form complex but organized sets of knowledge. In spite of recombining the discrete pieces of explicit knowledge into a new form, no new knowledge is formed; it is just blended and refined for improvement.

4) Internalization (explicit to tacit) - *embodying explicit into tacit operational knowledge*
This process involves sharing mental models and technical intellect to personify explicit into tacit knowledge. It is about internalizing new individual experiences i.e. 'learning by doing' (Nonaka & Takeuchi, 1995) to broaden, extend and reframe them into one's own existing tacit knowledge.

2.4 Definition of Knowledge Management:

With the elucidation of knowledge at hand, the concept of KM can be understood. Its definition varies across the industries and organizations with the focus of majority on employing knowledge for organizational competitiveness apart from the public sector and non-profit organisations. NASA describes it as the conveyance of precise information to the right people at the accurate time while assisting individuals in the creation and sharing of knowledge to utilize information to evidently improve performance (NASA, 2008).

Some authors describe it through its functionality. KM is about determining *who gets what when and how* (Choucri, 2007). Few authors advocate perceiving it as a process rather than a function. They perceive knowledge as a mental substance, residing in individual minds and exhibited in texts and behaviours, rather than a process which restricts its understanding (Nicolini, Gherardi, & Yanow, 2003). The process of KM starts from the identification and analysis of accessible and essential information leading to the consequent planning and control of activities to grow knowledge assets (Chawla & Joshi, 2010). There are also explanations of it via cultural notations which Jones (2005) describes as the development of a culture in which the management structures are transparent and accountable with the free flow of knowledge across boundaries with the essential recording, managing, storage and organization of information (Jones, 2005).

Overall, KM works as a structural process to solve the business needs to incorporate the organizational priorities and goals to deliver sustainable benefits. Although there are diverse

interpretations of the KM conception, there are similarities on the application front and its purpose.

2.5 Diverse outlooks of Knowledge Management:

Research done by (Fugate, Stank, & Mentzer, 2009) suggests that for the expansion of shared interpretation, necessary steps should be ensured to systematically interrogate disseminated intelligence for mutual understanding of its meaning and implication while resolving conflicting interpretations swiftly (Fugate, et al., 2009). This is due to the fact that diverse opinions lead to new learning and enhance the range of prospective responses.

From a recursive view of the project based organization, although organization memory and the project processes function at different levels of analysis, yet they interact in such a way so as to transform each other (Koskinen, 2010). This is due to the fact that in project based organizations the generation of knowledge depends on the transmission of knowledge between individuals and across boundaries. KM deals with the memory of the organization in the form of data, information and knowledge which lead to decision making regarding risks, resources and others. This further generates information which can be fed back into the loop and re-used in an iterative process. The organizational memory and processes are united via KM as a link joining the learning of one part to the other via a two-way information flow so they can interact with each other even in isolation.

But there is an ambiguity aspect to it as well which confines its applicability and necessitates rapid response and action. Some authors elucidate the uncertainty of the organizational knowledge context as they describe the difficulty in effectively predicting the outcomes and providing solutions for problems when knowledge retains a restricted shelf life as a result of frequent changes (Herremans, Isaac, Kline, & Nazari, 2011).

2.6 Categorisation of Knowledge Management:

In spite of the diverse interpretation within different contexts, the essence of KM remains: how, when and where is the knowledge taken from and how, when and where it is applied. As it is described, the acquirement of interactive knowledge takes place through participation with constant reproduction and negotiation which leads to its dynamic and provisional character (Nicolini, et al., 2003). Choi, et al. (2006) segmented the approaches of KM using

this as the basis while utilizing the research done in the past including Nonaka and Takeuchi's spiral of knowledge. The KM strategies have been classified under two categories (Choi, et al., 2006):

KM source

i) *External oriented:* Knowledge from outside sources i.e. through transfer, acquisition, imitation etc.

ii) *Internal oriented:* Knowledge generation and dissemination within the organization

KM focus

i) *Explicit oriented:* Knowledge codification and storage through advanced ICT for reuse

ii) *Tacit oriented:* Knowledge personalization approach to communicate tacit knowledge through person to person contact and socialization processes

At the KM source level, the organizational knowing resides in the followed practices of action which are interactive, facilitated by metaphors and moulded from the context of interaction (Nicolini, et al., 2003). With a contradicting view, some authors describe knowledge to be an immaterial and atemporal substance which can be taken out of context for the purpose of recording, distribution and classification portraying the internal and external oriented facet of KM.

The explicit oriented KM focus is usually referred to as system oriented or codification strategy and the tacit oriented as human focused or personalization strategy. Codification strategy involves the extraction of knowledge, to make independent from the person who developed it and then reuse it whereas the personalisation strategy emphasises on the interaction among individuals (López-Nicolás & Merono-Cerdán, 2011). The studies done by Choi and Lee (2002) suggest that for socialization and internalization, the human strategy should be appropriate and for externalization and combination, the system strategy should be suitable (Choi & Lee, 2002).

2.7 Domains of Knowledge Management:

The latest concept that is arising is the notion of complementarity which explains the relation and connection among the KM strategies and practices. It assumes that the KM techniques are mutually complementary and increase the influence and effect of each other if implemented together. This has been proved true by research done by Choi et al. (2006) which verifies that the application of individual KM strategies leads to minor performance gain whereas the adoption of its full set simultaneously results in high performance (Choi, et al., 2006).

Proceeding further, there are 'ten domains' (Holtshouse, 1999) in which the purpose for supporting KM are segmented:

1) Sharing knowledge and best practices
2) Instilling responsibility for knowledge sharing
3) Capturing and reusing past experiences
4) Embedding knowledge in products, services, and processes
5) Producing knowledge as a product
6) Driving knowledge generation for innovation
7) Mapping networks of experts
8) Building and mining customer knowledge bases
9) Understanding and measuring the value of knowledge
10) Leveraging intellectual assets

2.8 Techniques of Knowledge Management:

The key methods, tools and techniques used to fulfil the aforementioned domains are described below:

A. Forming Communities of Practice (COP's):

The COP is a virtual community or informal group sponsored by an organization to facilitate knowledge sharing or learning (Cox, 2005). They are formed by individuals who involve in processes of shared learning in a collective field of human effort. In simpler terms, it is usually a naturally forming network of employees with similar interests, skills or experience.

B. Creation and utilization of knowledge database

The knowledge database is a category of knowledge repository used for bookmarking, searching and exploiting the information required. This, in some organizations, is also known as the best practices database. Diverse nomenclature is associated with it across organizations. The technical terms include DMS (Document Management Systems), Knowledge banks, Document repositories and others. Such information database is useful in organizations where best practices need to be repeated and disseminated as much as possible (Uriarte Jr., 2008).

C. Incorporation of Lessons Learnt into strategies

The project process is a stream of new learning. The knowledge is degenerated with the inclusion of similar errors being repeated until and unless the experience gained in one project is diffused to the organizational strategic level and applied in other projects (Koskinen, 2010). As a result of this the lessons learnt have to be utilized to include them into the strategic plan resulting in the formation for best practices.

D. Brainstorming sessions

Brainstorming is one of the most followed techniques for knowledge creation. This process provides numerous solutions to problems by stretching ideas to the limit. This in turn encourages cross-fertilization of ideas giving confidence to employees to adopt best practices (Chawla & Joshi, 2010). It finally leads to the assimilation of combined thinking with shared mental models.

E. Establishing Knowledge Maps

Knowledge mapping is a process of creating a network of knowledge repository by locating and organizing the intellectual capital. It regulates the skills and experience by providing a platform for the methodical evaluation and accessibility of the organizational members' competencies to everyone. Other technical notations for this include the Expertise Locator (EL) system, Hard-Tagging where this process is followed but with a focus on the formal mentoring process (Neef, 2005). This concept is based on the idea that most knowledge usually exists within the organization and does not have to be imported and thus just needs to be identified, captured and harnessed.

F. Performing Knowledge Audit

The literature of KM recognizes the importance of two concepts: the first is the exploration and analysis of existing knowledge practices for the identification of gaps and the second is to relate KM to the business goals (Jones, 2005). Information Management (IM) as a key constituent of KM solves the first purpose by providing a way to scrutinize knowledge to accomplish organizational goals in the form of an information audit. The information audit is a methodical scrutiny of information resources, their flow and use, with orientation towards people and existing documents for instituting links to organizational objectives (Jones, 2005).

Knowledge audit analyses the organization's efficiency in the utilization of information and the alignment of the information sources and processes towards the organizational objectives. This is achieved by identifying the activities and tasks as well as the information required for them which lead to the accomplishment of the business goals. Apart from this, the audit scrutinizes where, by whom and how the information originates, and then where it leads to, to whom it is given and what happens to it after that. This information flow assigns strategic significance to information thereby assisting in managing relevant information by prioritization. Failure in prioritizing using strategic significance to organization can lead to managing everything instead of precisely what should be managed.

G. Benchmarking

This is one of the tools for performing the procedures of monitoring and reporting. It solves the purpose of generating explicit knowledge for organizations by measuring and reporting the intellectual capital. It provides a framework for the growth of the organization by portraying a comparison with the industry level standards in terms of the competency level, the capability possessed and the knowledge incorporated. Moreover, benchmarking of internal KM processes makes apparent the knowledge gaps between the stakeholders (Chawla & Joshi, 2010).

Apart from the major abovementioned tools and techniques, the other less frequently used KM strategies for corporations include the usage of rewards (knowledge sharing through motivation), storytelling (for transferring tacit knowledge), cross-project learning through knowledge transfer and people transfer, after action reviews (for the formation of best

practices), knowledge fairs (for stakeholder involvement), using collaborative technologies (groupware, etc.), by means of social software (wikis, social bookmarking, blogs, etc.), delegating designations such as knowledge workers, CKOs (Chief Knowledge Officers) & knowledge brokers (individuals acting as a reference for information on specific topics, fields or subjects). As these KM methods as strategies need to be applied in practice in order to come into existence, their effectiveness is dependent on the willingness and active participation of the individuals as knowledge workers.

2.9 Role of Information and Communication Technology:

Information and Communication Technology (ICT) is one of the essential elements of KM which assists in managing the knowledge of the individual, group and organization. This is usually incorporated in the Knowledge Management Systems (KMS) of the organization. Jim Collins in his book 'Good to Great' (Collins, 2001) states the term *black box* for the systematically coded categorized material such as strategy, technology, leadership and so forth which takes the outcomes of the company from good results to great results. It may not be a flaw to call this *black box* as the present day knowledge management systems (KMS) as this is what these systems are and the result is what is expected out of them.

The major ICT tools used for the purpose of KM are Decision Support Systems (DSS), e-mail, voice mail, teleconference, videoconference, web conference, virtual work space, threaded discussions, instant messaging, online learning applications, FAQ (Frequently Asked Questions) database, reporting tools, e-calendars, collaboration tools, data servers for repository of documents and others (Alhawaria, et al., 2011). Other ICT tools used at the organizational level include Records and Communications Systems (such as Lotus Notes etc.), Human Resources Systems (such as PeopleSoft, Staff directory etc.) and Information Request Tracking tools. These tools solve the purpose of information sharing, discussion, brainstorming, collaboration on tasks and collaborative decision making.

Study linked to e-business performance conducted by Tiago, Couto, Tiago, & Vieira (2007) showed that employee's access to databases had a positive impact on business performance. But it had limitations too as it included just a limited set of aspects of the KM cycle. Moreover, the individuals' knowledge flows and its management in the organization was not considered. A number of blogs and commercial websites provide offerings like 'complete

integrated design environments', 'principles for KM success', 'KM toolboxes' and 'knowledge portals' including the Document Management System (DMS). They claim to assist in KM but are comparatively just software applications that depend on the humans to feed information to work and receive any benefit from them.

It has to be understood that ICT is only part of IM and assists in KM but becomes useless without appropriate utilization. Technology acts as a facilitator and an enabler of connections and knowledge flow but is far from being the core of the organizational KM system (Coakes, Amar, & Granados, 2010). Although it is an essential part, its utilization in isolation from the individual users only leads to the creation of knowledge junkyard. It is to be utilized as a means to an end and not a means in itself (Chawla & Joshi, 2010). The crux of the matter is that the ICT assistance is essential but without the human touch it becomes obsolete. As Conley and Zheng (2009) claim "Although technology is vitally important to enabling staff to collaborate, it can also be overemphasized to the detriment of the KM initiative as a whole, as the role of an organization's technology infrastructure should be seen as a tool in support of KM initiatives and not as the basis of the initiative itself" (Conley & Zheng, 2009, p.342).

Therefore, ICT tools are useful to an extent that they sustain and enhance communication and coordination. Moreover, the organization's focus should be on using technology to facilitate employee's knowledge flow and interactions rather than focusing on technology per se. On the whole, the issue of KM is less concerning the intelligent technology but more regarding the appropriate and intelligent use of technology.

2.10 Application of Knowledge Management:

On the application front, in the past only a few large technology firms practiced KM but these days a greater part of organisations engage in KM irrespective of their size and business domain (Coakes, et al., 2010). But there are still variations and irregularities based on the structure of the organizations such as: "KM practices are more widespread in firms that have adopted new methods of management, known as project-based organisations – companies that are using Internet intensively as a search tool and that are intensive in R&D" (OECD, 2004, p.3). Although the KM systems, infrastructure and processes are already present in today's scenario, there is a need to change the approach towards a more co-ordinated way to increase effectiveness. The research survey completed by Coakes et al. (2010) indicate that

KM strategy still has to go further to incorporate the organizational culture in the formulating process of KM strategies to fully utilize the available KM tools and techniques (Coakes, et al., 2010). Overall, the apparent purpose of KM is to connect the diverse assets of knowledge through the application of appropriate technology. As it represents relevant issues in the processes and procedures of organizations, its span of application is continuously increasing. As a consequence of ambitious challenges and intricate issues faced by businesses, KM practices are continuously expanding towards numerous decision-making contexts (Bolisani & Damiani, 2010) such as RM and others.

Chapter-3

Risk Management Literature Review

This chapter provides a review of the Risk Management literature. This is provided by briefing the history and background first. This is followed by the classification of the risks and then defining the difference between uncertainty and risk. The chapter then highlights the RM process and the techniques that are used for it. Finally, the last section describes the constraints that RM faces.

3.1 Background and history:

The term ‘risk’ is derived from the Italian word ‘risicare’ which carries a practical meaning of ‘to dare’ (Aghili, 2010) which interprets risk being a choice out of the available options rather than fate. Humans have always been fascinated about randomness and since long have tried to predict and control uncertainty. This has led to the development of the modern day probabilistic theories.

It was the mid of the 17th century which lead towards the unearthing of the probability theory, thus forming the mathematical core of the notion of risk (Bernstein, 1998). This was the time when people first started to make decisions and predicted future by using numbers. With the passage of time, mathematical scholars of the 18th century had developed the probability theory into a powerful tool to organize, interpret and use information (Vargas, 2009). This steered towards the discovery of the statistical sampling, normal distribution curve also known as the bell curve and finally the origination of the standard deviation.

By the late 19th century, Thomas Bayes contributed to the study of statistics by showing how to make decisions by mixing new information with old information (Vargas, 2009). His theorem focused on the frequent occasions to make intuitive and safe judgments about an event. RM as it is practised today is based upon the principles and phenomena explored in the early 20th century.

3.2 Risk classification:

Risks can be classified into ones which are concerned with the management of internal resources and can thus be controlled and the ones which are associated to the external environment and are relatively uncontrollable (Carr & Tah, 2001). This is due to the fact that the probabilistic relation in case of the external environment is to a large extent quite random whereas the internal resources lead to the formation of risk events which can be calculated and determined by the product of probability and consequence/impact. With regards to the internal capabilities, risk planning can be enriched by using knowledge and experience acquired by the various managers while working on several projects (Arrow, 2008). The organizational intellectual capital in terms of the knowledge and judgement of the employees, defines the approach to sense and respond to risks.

3.3 Project outlook of risks:

In the project context, risk is deliberated to be a disruption, the realization of which leads to the diversion from the project objectives of time, cost, quality, scope and others (H. Zhang, 2007). From the information perspective, risks overall are a cluster of factors formed on the perspectives of the diverse stakeholders. From the project perspective, the risks can arise from the business or the operational aspects. In the initial stages, the business risks are emphasized and during the implementation the operational risks are primarily considered. But there should be an optimum balance between the two without ignoring any trait at any stage of the project as the operational risks affect specific work activities whereas the business risks affect the project as a whole (Dey, 2010).

3.4 Definition of Risk Management:

With the diverse interpretations of risk, the domain of RM becomes even more complex with different organizations and entities defining it in different expressions. ISO defines it as a set of coordinated activities implemented in order to direct and control an organization with regard to risk (ISO, 2009). APM, on the other hand, defines RM as "A structured process that allows individual risk events and overall project risk to be understood and managed proactively, optimising project success by minimising threats and maximising opportunities" (APM, 2006, p.26).

The Institute of Risk Management perceives it as the process whereby organisations methodically address the risks attaching to their activities with the goal of achieving sustained benefit within each activity and across the portfolio of all activities p.2 (IRM, 2002, p.2). Dey (2010) describes it as "The systematic process of identifying, analysing and responding to project risk" (Dey, 2010, p.991).

But no matter what definition is used, the overall purpose of RM remains the same which is to assimilate information and approaches from the different parts of the project on a particular aspect of uncertainty. Therefore, RM is required to take into account the past problems leading to complications, present challenges and predominant inclinations which impend the project's successful implementation.

3.5 Knowledge and Uncertainty:

As made apparent Figure- 3.1, during the execution stage of the project, as the knowledge about the project increases, the risks decrease. It reveals that at the beginning of the project, numerous qualitative risks are present which reduce with the access to and availability of information.

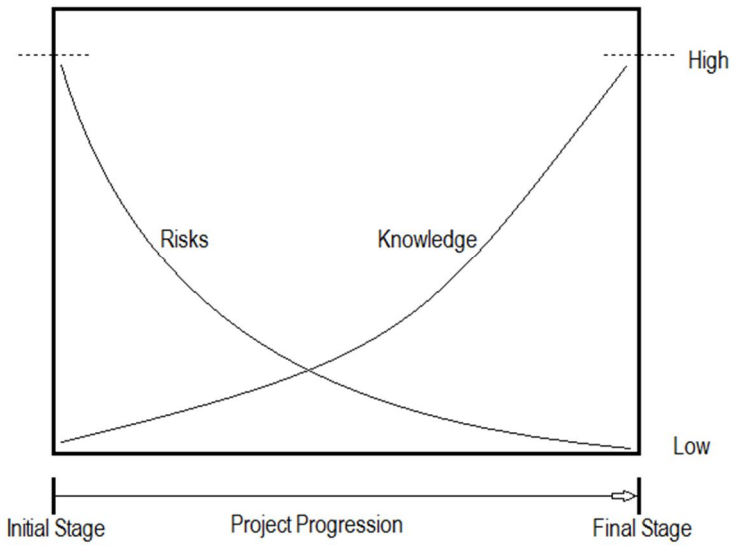

Figure 3.1: Knowledge and risk change during project

Projects are enclosed by risks in all the phases and response actions are identified, assessed and carefully chosen on the basis of the knowledge accessible at that stage (Seyedhoseini, Noori, & Hatefi, 2009). The US National Research Council advocates the pro-active approach to project RM (Arrow, 2008). A pro-active methodology to RM reassures learning from experience for anticipating, recognizing and managing both the threats and the opportunities inherent in risk (UNESCO, 2009).

This can be accomplished by starting the RM process early in the project life to take account of the engagement process of all the stakeholders in the process. In the early stages of the project, the risks associated are based on the uncertainty which restricts taking decisions to precede the project. This uncertainty can be defined as a state for which there is lack of information. Measures for tackling the risks can be initiated if amply precise information is accessible. This makes the identification of qualitative risks necessary early on in the start phase of a project along with assessing their impact and probability (Franke, 1987).

Regarding the dilemma of the information domain, Duncan (1972 cited in Herremans, et al., 2011) elaborates on three characteristics hindering the process of decision making in dynamic environments:

1) a deficit in available information
2) inability to assess in advance the effect of an incorrect decision
3) inability to assign probabilities to predict outcomes

3.6 Uncertainty and Risk:

Some authors view risk from the lens of uncertainty which can lead to threats as well as opportunities. Knight (2006) has done seminal work on risk and uncertainty and he perceives the situation from both the perspectives. He names *Risk* as the case where the probability of statistical variations with the distribution of its outcomes in known with the effect that the randomness is measurable (Knight, 2006). On the other side, the cases where distribution of outcomes are unknown with the effect that the randomness cannot be measured are named as *Uncertainty* (Knight, 2006). The cases in the conditions of Risk can be classified into categories whereas under Uncertainty every situation is unique and thus only judgements can be made.

Uncertainty associated in actual circumstances frequently is 'epistemic' i.e. it is related to the knowledge of things rather than being 'aleuronic' things i.e. depending on a chance or randomness (Rebiasz, 2007). Epistemic uncertainties arise due to the lack of knowledge about the situation and are a characteristic of the analysts dealing with the situation whereas the Aleatory uncertainties arise due to the possible variations in the outcomes which surface as a result of the associated randomness and are a characteristic of the situation (Aven, 2010). Therefore the epistemic uncertainties can be decreased with access to more and precise information but the aleatory uncertainties are fortuitous and are thus irreducible.

Keeping this within the context, Apgar (2006 cited in Massingham, 2010) states that knowledge directs individuals along the spectrum of uncertainty towards certainty, thus making risk a 'learnable' rather than an entirely random event. Uncertainty analysis ought to play an integral part in RM to ensure that the uncertainty in the RM process through the management of information quality is kept at an economically feasible level (Emblemsvåg, 2010). A drawback of this notion is that this necessitates the development of novel methods

for the congregation of information and data and its processing with the formal explanations of uncertainty (Rebiasz, 2007).

Some authors Jiang et al. (2008) advocate using a suitable strategy of understanding the perception gaps to address difficulties for the mitigation of uncertainty present at the start of the project due to the differences in insights of the stakeholders (Jiang, Klein, Wu, & Liang, 2008). The perception gap is the presence of diverse interpretations of a project task by different stakeholders which can be due to dissimilar frames of reference and thus leads to the foundation of a knowledge gap. As a result of the complexity due to vagueness and uncertainty, risk assessment usually relies on the expert's intuition based on experience (Shi, Li, & Meng, 2009).

3.7 The Risk Management process:

The process of RM according to the International Standards Organization is inclusive of five key stages (ISO, 2009):

1. **Establishing the Context**

   This step defines the external and internal parameters that organizations must consider when they manage risk (ISO, 2009). It is used to define the scope of RM for the selected area of the project. This then leads to the formation of the aims and objectives of the project in consultation with the stakeholders. This is followed by the development of the basis for risk evaluation, the constraints involved, establishing framework for risk analysis and the measurement of resources available. SWOT and PESTEL analysis are often done to analyse the project context.

2. **Risk Identification**

   It is a process that involves finding, recognizing and describing the risks that can affect the achievement of an organization's objectives (ISO, 2009). This classifies the sources of risks that hinder the achievement of the objectives. It takes into account the causes of the risk as well as the impact that they can have. There are many techniques used for this process which include questionnaires, brainstorming, lessons learnt and others. The RBS (Risk Breakdown Structure) acts as an essential tool for risk identification, a useful structure for managing risk ownership by assigning resources

(Arrow, 2008). The result of this process is the project risk profile which describes the project assessed, its environment and objectives.

3. **Risk Analysis**

   This is a process that is used to understand the nature, sources, and causes of the risks that you have identified and to estimate the level of risk (ISO, 2009). This process is used to establish the relationship between the risk consequence and the risk event triggering it (H. Zhang, 2007). One of the commonly used techniques for this process is the DELPHI technique. This step assists in the transformation of risk data into decision making information. The outcome is a comprehensive examination of every effective risk and its probability, impact, severity, and priority assessments.

4. **Risk Evaluation**

   This is a process that is used to compare risk analysis results with risk criteria in order to determine whether or not a specified level of risk is acceptable or tolerable (ISO, 2009).

5. **Risk Response**

   This is a risk modification process (ISO, 2009). This is the action phase where the mitigation step is taken. There are various risk response strategies in terms of treatments available for this step which can be taken depending on the severity of the risk. These would not be utilised much for discussion and analysis in the research, so the strategies are not described in detail. They are as follows:

   i) Risk avoidance
   ii) Risk reduction
   iii) Risk transfer(insurance)
   iv) Risk retention (tolerate)
   v) Risk termination (elimination)

There is however, one step missing from this model which is the monitoring of risks. This is a feedback process. To monitor means to supervise and to continually check and critically observe (ISO, 2009). This solves the purpose of assessing and updating the status of risks, the necessitated action required, the effectiveness of risk treatment and to weed out new risks and their sources.

3.8 Risk Management goal:

The goal of RM is to deal with all the risks inherent in the project and its context. This is executed by organizing the risks on the basis of frequency of occurrence, level of impact, importance followed by the arrangements needed to control the identified risks. Risks can be categorized into two segments based on its structure: the ones whose costs can be estimated namely quantifiable risks and the other whose financial impacts cannot be directly anticipated i.e. qualifiable risks (Franke, 1987) which forms the base for the next section.

3.9 Risk Management Techniques:

By use of Change Management principle in the context of cost control, the quantifiable risks are assessed but the ambiguity regarding the net financial consequence of the aggregate risks to the total cost of the project is still upheld by the uncertainty of the cost effects of the qualitative risks (Franke, 1987). On this basis, the RM techniques are segmented into two parts: Quantitative and Qualitative which are described below.

1. **Quantitative techniques:**

   One of the most intricate part accompanying project RM is the quantification of risk (Rebiasz, 2007). The industry wide used key techniques include:

   i) Monte Carlo analysis
   ii) Scenario planning
   iii) Sensitivity analysis
   iv) Expected value analysis
   v) PERT (Program Evaluation and Review Technique)
   vi) Fuzzy set analysis
   vii) Risk data quality assessment
   viii) Decision Tree Analysis
   ix) Modelling and Simulation
   x) Probability Distribution

   Some of these techniques are less applicable as they necessitate the need for detailed information which is generally not available at the planning stage and thus there is a difficulty in making accurate decisions (Dey, 2010).

2. **Qualitative techniques:**

   The qualitative risks include the risks regarding contractual obligations, variations by the client, design variations, incomplete or inaccurate cost estimate. The industry wide used key techniques for these risks include:

   i) FMEA (Failure Mode and Effects Analysis)
   ii) Fault tree analysis
   iii) Event tree analysis
   iv) Risk Probability and Impact Assessment
   v) Probability and impact matrix
   vi) Cause-Consequence Analysis
   vii) Risk Data Quality Assessment
   viii) Risk Categorization
   ix) Risk Urgency Assessment
   x) Delphi Technique
   xi) Brainstorming
   xii) Assumption analysis
   xiii) Checklist analysis
   xiv) Expert Judgement

To follow these techniques various tools are used some of which are:

1) Risk register
2) Risk catalogue
3) Spread sheets
4) Focus group discussions

3.10 Risk Management constraint:

There is a restriction to RM techniques as well. The wrong use of tools and techniques can lead on to taking a decision, which can be destructive in nature, with confidence based on the RM technique. As individuals vary in their perception of reality, knowledge by training through tools for comprehending the nature of risk can enhance objectivity of individuals to process risk in the same way (Massingham, 2010). Thus the qualitative risk techniques can be made more precise by reducing the vulnerability of subjectivity as a result of the human

factor. This vulnerability can be internally generated affected by the organizational, social or economic factors (H. Zhang, 2007).

On the down side, it has to be acknowledged that there is a contradiction that the increasing dependence on RM drives the decision-makers to undertake risks which in optimum situation can have been mitigated (Emblemsvåg, 2010). The thing that can be of the essence and make a difference is the real time risk assessment and monitoring.

Chapter-4

Methodology

This chapter illustrates the framework around which the structure of the research is based. This is described in terms of the research design and the process followed for it. This is followed by the justification of using interviews as primary data collection tool. The final segment describes the data processing and analysis methodology used.

4.1 Research Design

The study, due to its novel character, has made use of the qualitative approach and explored the literature published up to date with the analysis of its practical application aspects in projects. The research has been conducted by collecting the required data according to the research needs by using the literature sources such as books, articles and journals but to complement the research, primary source in the form of interviews was also utilized.

The main focus of the research was desk-based study which was conducted first and then followed by six interviews as part of primary research which was used to examine and verify the validity of the findings to eventually provide a platform for discussion and deliver recommendations. The aim and objectives of the research were identified to define a path for the study and to keep track of progress as explained in the Introduction Chapter-1. The two phases of secondary and primary research were segmented into four steps in order to fulfil the objectives of the thesis:

- First of all, a broad literature review was conducted by examining and using a number of secondary sources to gather data and current theories for the initial study. This was completed for both the KM and RM literature. Various information sources containing data that have already been collected and compiled consisting of readily available compendia, already compiled statistical statements and reports were utilized to identify the sources of risks present in the initial stages. These were in the form of census reports, annual reports and statistical statements of businesses, reports of government departments, publications of international organisations such as UNO, IMF, World Bank, ILO, OECD, WHO and others.

- Secondly, PMBOK, APMBOK, PMI journals, RM & KM journals, APM articles and RM & KM books with detailed methodologies and processes were analysed to identify and examine the tools and techniques of RM used in the early stages which included the existing systems of risk registers, risk matrices and others. An in depth analysis of the KM tools and techniques was then carried out by utilizing the current books and latest articles to explore the similarities between KM and RM tools and the conditions under which the KM techniques can be applied to RM.

- Thirdly, to verify the findings from the literature review, interviews with representatives from project based organizations were conducted to analyse the factors relating to the project context. This was based on the findings from the desk-based study, which utilized reports and other sources as mentioned in the first two points, to make it thorough and comprehensive. These findings formed the basis for creating an interview template and six interviews were then conducted with experienced professionals in project positions working on different projects, which were rendered sufficient to complement the secondary research. This specifically included in the interviews about how the project managers dealt with risks by using KM practices of brainstorming, lessons learnt and others (which may not be directly apparent to them).

- Lastly, a detailed discussion and analysis followed based on the literature review, the information assessed and the interviews to explore the means of improving the tools and techniques of RM used in the early stages which formed a rigorous foundation to base the conclusions on. This utilized the strategies and approaches of KM and RM with the feedback and suggestions from the interviews in delivering the final verdict, conclusions and suggestions for future studies.

4.2 Research Process

The qualitative data collection for the research followed a continuous process. As previously described, the first phase included the literature review based on the numerous books, articles and journals on the various issues that affect the project risk and its management. Similar sources for KM were also exploited in parallel to RM to understand the extent to which KM, through its tools, techniques, methods and approaches, could be utilised. This was followed by analysing the reports of international organizations and publications of government departments for extended literature review and to explore a collective pool of the risks and its sources faced by majority of them. With the realizations of the risks in the initial stages at hand, the formulation of research questions and their categorisations into segments, as mentioned in the introduction, was prepared. This resulted in a preliminary framework with findings for the study from the secondary sources which was enough to base the conclusions on. But to make it more practical oriented for application in practice and to offer pertinent

real-world recommendations, its verification in the project context through appropriate method of primary data research was necessary.

The primary data collection could have been executed in several ways. The various applicable options available were the observation method, case study, questionnaires and interviews. The observation method was phased out as inappropriate as it takes enormous time along with the subjectivity that it introduces about the interpretation of observation (Dhawan, 2010; Kothari, 2004; Punch, 2005). A case study also requires long time which was constrained in this situation. The results obtained in a case study are from only one organization in which it is conducted and are biased towards it (Punch, 2005). Moreover, this method is based on several assumptions which may not be realistic in all situations (Kothari, 2004), therefore the possibility of a case study was ruled out. Another option was using a questionnaire but as it is a standardised means of gathering data, there is no possibility for explanation in case of confusion in the questions which the participants might misinterpret (Berg, 2009). Moreover, the questionnaires are incontrollable, slow to receive information from, have ambiguity in replies or even their omission (Kothari, 2004).

Finally, interviews were chosen as the method for collection of primary data as more information in greater depth can be obtained (Dhawan, 2010; Kothari, 2004; Punch, 2005). Interviews can probe into exploratory questions depending on the context with the benefit to ask follow up questions which are missed if a mail survey using questionnaire was used. Interviews avoid misinterpretations by adapting the language accordingly to the ability or educational level of the person interviewed (Kothari, 2004; Punch, 2005). Moreover, it incorporates the observation method which can be applied to the verbal answers to numerous questions (Kothari, 2004). To embrace this and obtain current in-depth understanding, semi-structured interviews were concluded to be the optimum option. This ensured that the same information was collected but it still allowed for a certain amount of freedom to adapt to the context and to fit to the situation of the interviewee. It makes it easier to obtain personal information (tacit in some cases) which is hard to obtain through questionnaires or other medium (Berg, 2009; Kothari, 2004) and resistance to answering some questions can be overcome with appropriate usage of interviewer's skills (Dhawan, 2010; Punch, 2005).

The approach considered face-to-face interviews but due to diverse geographical locations of the interviewed personnel some of the interviews were conducted via telephone which still

maintains the personal contact between the respondent and the interviewer. For better handling of the questions as well as the situation, the interviews were conducted by the author himself while avoiding any bias that could possibly influence results. This facilitated as the author had the understanding of the importance as well as background of the study. The next step was of conducting the interviews as a data-gathering method of the qualitative research. This was followed by the emphasis on the methods of description, analysis, and interpretation of the interview data as part of the process.

4.3 Interviews for data collection

The interviews were necessitated as they act as a source to obtain primary data that can complement the secondary data analysed in the desk-based study. These were however utilized in a more confirmatory rather than exploratory manner as part of qualitative research. This helped in the more affirmative research with a sensible blend of primary and secondary research. A total of six interviews were conducted. The rationale for them is explained in the next section.

4.3.1 Interview Rationale

The first aspect to pay attention to, after justifying and concluding interviews as the source for primary data, was setting a rationale for them. The requirement was to obtain confirmation and further develop the issues raised from the secondary research. As the data gathered from the secondary sources, in the forms of reports and publications of international organizations, had spanned over projects from across the world in diverse fields, a similar feature was required form the interviews as well. Consequently, the interviews necessitated personnel from different project domains with strong experience in PM.

Therefore, the interviewees were selected on the rationale such that their expertise varied in the Engineering, Construction, Manufacturing, Oil and Gas, Energy & Power and other industries. The utmost critical criterion of selection was possessing strong practical experience in the fields of both KM and RM. The respondents were selected on the basis of their professional profile which included their position i.e. Project, Program, Portfolio managers and team leaders with at least five years of experience on the complete management of projects i.e. overall knowledge and experience of projects from their start to finish. A total of six interviews were conducted which spanned across different industries.

This sampling number was deemed enough as it included all the information being looked for and encompassed all the criteria necessary for the interviews as the primary research tool. It is readily acknowledged that there are limitations inherent in this kind of study but as the interviews were to be utilized to complement the desk-based study, this number was sufficient. Moreover, as the primary research is not used to claim any statistical significance to the findings, hence no attempt is made to present the respondents or the organizations as statistically representative, neither are any statistical generalisations drawn. But still the results are still highly valid as they are built upon the findings from the secondary research with confirmation from the primary research.

4.3.2 Interview Objectives

The purpose of the interviews was segmented into objectives that made the aim for conducting them clear. As mentioned before, the interview template as the research instrument was based on the findings from Phase-1 of the study i.e. the secondary research. The objectives were defined from the topic and the research questions that arose from the secondary data which included the organizations project reports of UN, WHO, UNESCO, ISO, OECD, World Bank and others. The template was refined to make it as precise and brief as possible. The objectives are as follows:

- to analyse the level of KM and RM in the organization and the tools used
- to verify risks of the early stages as investigated by the secondary research and analyse their depth
- to understand the interviewee's perspective on the similarities between the KM and RM and confirm the ones found in the research
- to receive the interviewee's feedback on the incorporation of KM into RM and suggestions for improvement of both RM and KM and their mutual functioning

4.3.3 Interview Methodology

The interview followed a semi-structured approach rather than fully structured which rendered it flexibility to mould to the context. This approach is suitable as the order and wording of the questions may be customized during the interview (Punch, 2005). In, the semi-structured format of the interview, the interviewer may answer questions to make clarifications for attaining superior responses (Berg, 2009). Depending on the information being accessed, new questions as per the feedback of the interviewee were formed leading to

an unbiased discussion and confirmation of the objectives. This reduces flexibility in comparison of interviews (Kothari, 2004), but does not restrict the study as the data obtained will not be utilized for comparison. Moreover, this provides additional freedom while the responses are recorded to include relevant aspects and exclude the ones that may seem inappropriate (Kothari, 2004).

The interview was supplemented by open-ended questions in the interview template which were based on the findings originated in the research. This way the interview was not constrained on just the questions provided or the options available. This rendered freedom in tailoring the questions to the context of the situation and provided an open framework for focused, conversational, two-way communication. The questions followed a sequence within the template which had a blend of scaled response as well as standardized open ended questions. The interviews were conducted in person or over the phone in some cases. Each interview took around 30-45 minutes to conduct. The process of analysis of the information obtained both form the secondary as well as the primary sources is explained in the next chapter.

Chapter-5

Analysis

This chapter provides the analysis of the information gathered for the purpose of research. This is first prepared for the secondary research, which forms the framework for the primary research, the interviews of which gathered information which is then examined. This in turn forms the base on which the discussion is based.

5.1 Secondary Data Analysis

This section utilizes the reports and statements of companies and international organizations along with the issues raised in the journal articles to provide an analysis of the secondary research obtained from the extended literature review. The analysis of secondary data first is very essential as it protrudes the areas that need to be verified through the primary research in the form of interviews. While doing so, the analysis probes the first objective of investigating the main sources of risks that originate from the beginning of the project i.e. from the early stages. The analysis of secondary data is described in the next sub-section.

5.1.1 Sources of Risks at the initial project stages

These risk sources are the restrictions that initiate at the project initial stage i.e. the planning stage (Farias, Travassos, & Rocha, 2003). As described in section 2.2 of the research on RM, these sources are of epistemic nature i.e. they are related to the uncertainty regarding the knowledge of things which forms the focus of this section. These risks are dynamic in nature as they change over time with the increase in the availability of precise and detailed information. The actual uncertainty is not a risk in itself but in turn leads to it. While the uncertainty ascends due to the lack of information, the underlying risks arise due the decisions made in that situation (Emblemsvåg, 2010). A collection of these sources of risks have been gathered from numerous international organizations to advance the understanding of the issue.

The process of KM starts at the knowledge generation stage which coincides with the proposal stage of the project. All the information is required to be in explicit form to be put into documents. Here, the process of externalization is taking place as the stakeholders' expectations and the underlying assumptions, which are in tacit form until this stage, are being put into contractual terms and the scope of the project is being defined. The main problems encountered during this early project stage which become the sources of risk as found in the research are described below:

1. ***Unavailability of information:***

   WHO through experience of its diverse projects have recognized that the process of knowledge production and synthesis is costly and slow (WHO, 2006). Due to this

progression being expensive, some of the aspects of knowledge generation could be turned down which leads to the lack of information. As regards its slow nature, there may be poor or no access to relevant information due to the ambiguity about knowledge being produced by the time it is required. As a result, there is a gap between expected and available information sources (UNESCO, 2009). Maylor (2010) describes it as "The gap between an actual situation or the perception of it and the required or expected situation" (Maylor, 2010, p.338). Moreover, this gap is inflated by the lack of knowledge sharing, especially within stakeholders and the project team members.

2. ***Absence of a mutually defined context:***

This is the first step in the RM process as already described in the literature review section. Uncertainty in the context of projects is the lack of information which is apparent as the difference between the available and desired information for performing an activity (Antvik & Sjöholm, 2007). Embedding the process of defining a collective context into the organizational culture is a challenging but necessary endeavour (UN, 2010). But still organizations fall into the trap of executing the project, failing to recognize the significance of creating a shared context first. This is partly as a result of tight project budget and schedules leading to dearth of interactive communication between producers and users of information. This interaction can determine the sources of existing data and information via tools of knowledge mapping and others. It can assist with the methods of accessing them, evaluating the needs and assumptions of the diverse stakeholders and then sharing it with all, leading to a mutual and shared pool of information.

The context at this stage is an issue as it builds varied interpretations but the advancement towards a shared context progresses towards achieving the KM as well as RM goals. Moreover, the establishment of mutual context assists in the identification of the risks and the capabilities of the organization. A SWOT analysis solves this purpose by substituting the risks with threats and opportunities and the organizational capabilities for strengths and weaknesses (Emblemsvåg, 2010). A knowledge SWOT can also elucidate the process of an information audit here.

3. ***Inadequate information flow:***

One of the sources that lead to the development of risks is the insufficient flow of the information which restricts the knowledge spiral process described in the literature review. This risk source varies across project organizations depending upon the depth of KM being put into practice as made apparent by primary research. The lack of information bundled with the poor information flow among the different teams and individuals act as obstacles and become apparent with their hindering effects (Mabudafhasi, 2002).

The resulting effect of this restricted flow is the constrained synergy among the initiatives taken which are not aligned with each other and may cause conflicts. Moreover, this can lead to inability in consideration of all involved factors and variables necessary to take a decision (Maylor, 2010). The management of risk is dependent on the frequent streaming of data and information through the different departs of the organization. The purpose of managing the flow of information is to assist individuals and teams in better decision making which is critical for moving projects forward.

4. ***Lack of common framework of reference:***

While executing projects in different nations across continents, WHO has reckoned that there is an absence of a common framework for knowledge transfer and translation (WHO, 2006). Due to this lack of reference, there is no consistency in the assumptions and analysis of different departments and individual possessors of knowledge. There is in turn a lack of a common organization wide RM approach. This fact is apparent at the UN too. At the UN office, the departments and programmes are utilizing their own different methodologies based on one of the numerous RM standards presently existing. As a consequence, there is a lack of consistency in the processes which leads to different approaches for identifying, evaluating, reporting and responding to risks even in the same project through different stages (UN, 2010).

Moreover even within these approaches there is lack of integration between the quantitative and the qualitative methods of analysis as explained in the literature review. With the increase in continuous innovations, knowledge sharing and concepts

of learning by doing, there is a need to develop comprehensive framework or common platform to fill the know-do gap in parallel with the systems to deal with it (WHO, 2006). This results in enhancing the capability to make informed decisions. By using a common framework, all the tasks come under a joint framework leading to an integration of the operations throughout the organization making apparent all the identified risks to all stakeholders thus increasing transparency, accountability and performance.

5. ***Ineffective linkage systems:***

   This is one of the complex problems arising right from the early stage of the projects made apparent by the international organization UNESCO. They have explored that scarce information combined with inadequate network systems restricts the formation and development of the links and connections between different knowledge domains (UNESCO, 2009). This is mainly originated from the fact that the data and information is present in dispersed forms throughout the organization. Different systems are used by the departments which are not compatible with each other thus leading to complexity in executing mutual actions and co-ordinated decisions. The intricate arrangement of the technological structures does not promote intersectional collaboration (UNESCO, 2009). This is quite critical in the dynamic environment of the project which necessitates the need for an integrated approach for the analysis of data and information. The ICT plays a major role by serving as a medium for information gathering as well as dissemination points which can further assist in designing a network for linking all the isolated knowledge areas into one collective web.

5.2 Primary Data Analysis

With the sources of risks apparent from the secondary data analysis, it was required to configure these into segments of questions for validation through interviews to confirm their existence and their extent. This was prepared in the form of an interview template, as a research instrument, which was used for every interview as already explained in section 4.3.3. This contained the questions to be probed. The analysis is shown in the upcoming sections.

5.2.1 Data Processing:

The first step after collection of raw data from the interviews was the process of content and data analysis. For this purpose, manual coding using both MS Word and MS Excel along with numerous paper copies was used. Computer software packages for qualitative analysis were not used as it was not deemed necessary with this sample size of six interviews. Moreover, these softwares are just tools for doing the analysis, not the analysis in itself. Every so often, research method descriptions are anchored in the researchers stating the usage of SPSS, NVIVO or other software for data analysis. But it has to be acknowledged that using specific software does not lead to making the research rigorous. The purpose of the primary research was to complement the secondary research by investigating the patterns either confirming or refuting what had already been found in the first phase through extended literature review which have been described in the upcoming sections.

5.2.2 Content Analysis:

Due to the customized and semi-structured nature of the interviews rather than structured, more stress was laid on the approach of content analysis to make sense and draw out apparent themes. This was implemented through editing which assured the consistency, accuracy and uniformity of data (Kothari, 2004). This was followed by 'Field Editing' (Kothari, 2004) which reviewed the information obtained. As the interviews were utilized for confirmation about the findings of the desk based study and to obtain suggestive feedback about the results, inferences were drawn from the collected facts through analytic induction which traced concepts (Punch, 2005) and finally writing down of summaries with the outlining of relevant areas to be used in the dissertation. To analyse a broader meaning of research findings, interpretations were made through the enlightenment of explanatory concepts which are described in the discussion and analysis chapter. These inferences explain the researcher's observations while providing theoretical conceptions (Kothari, 2004; Punch, 2005).

5.2.3 Interpretation process:

The process of interpretation as part of the analytic induction, which forms the basis for content analysis, was employed in steps. First of all, the points and facts that were prone to subjectivity and linked to a particular context were phased out (Punch, 2005). Secondly, the explanations of relations between wide sets of data were sorted out. Thirdly, all the pertinent links of the findings with each other were interrelated to find a 'coherent theme' (Berg,

2009). This built a framework for analysis to be utilized in the discussion section along with the secondary data. Finally, particular attention was paid to the fact to maintain a persistent prominence on the objectives of the interviews as well as on theoretical conceptions from secondary data sources. This interpretation process was accomplished after the consideration of all significant factors that affect the context to avoid false generalization (Kothari, 2004).

The analysis of the interviews was prepared in a systematic approach to make order and understanding as part of the content analysis (Dhawan, 2010). For this, a summary of each interview was concluded which incorporated the multiple choice, open ended and suggestive questions. The analysis was done in five steps namely:

1. Evaluation of the answers, data and results obtained
2. Purpose of evaluation and focus on topic
3. Identification of themes and patters and organizing the abstract
4. Confirmation of the secondary data
5. Utilization in discussion and conclusion

5.2.4 Removal of Bias and Subjectivity

The interpretation process has been utilized with suitable scrutiny to avoid any bias. The steps for interpretation process in the last section explain this. In the interview template, all the variables for analysis (irrespective of their importance projected out by the literature review) were included to exclude the effects of design bias. It is, of course, practically impossible to create perfect and unbiased research instrument (Interview template) no matter how hard it is tried in this situation to confirm the findings. But the interview template was independently analysed by the supervisor in Sweden to weed out any bias and was revised multiple times before confirming the final version. This paid particular attention to the language of questions to avoid any prejudice which could steer responses in a particular direction and to evade inclined phrasing. The moderator bias has been avoided by remaining neutral and not giving personal opinions while interviewing.

The research interviews produced some results which were not consistent with the rest of the data set. These were analysed but were not emphasised to avoid false generalization and hence are not portrayed as significant. Only the recurring theme and results in the forms of risk sources that have been confirmed by the primary research have been used for analysis

and discussion. Moreover, all the literature review, research findings discussion and all the research content has been peer reviewed by two independent persons to maintain objectivity.

The findings from the primary data collection are summarized in the next section. The suggestions and the recurring theme is then followed which was used along with the secondary information collected from the literature review for analysis and discussion.

5.2.5 Analysed Confirmations and Suggestions from Primary research

With the analysis of the literature, the prevailing theme about risks and the methodology to analyse primary data in hand, the interview template was formed and interviews were conducted. The key findings from the summaries of each interview (details provided in the evidence file) are briefed below. This describes the recurring confirmation of the literature review which makes apparent the overall theme, the key outlines of which are segmented into four segments as used in the interview template (See Appendix). The last segment also briefs the suggestions from the interviewees for the incorporation of KM into RM. The analysed content in segments is as follows:

1. **Level of KM and RM in organizations**

   There is an emerging theme of gradually growing/developing KM which is slowly penetrating into the organizational (business as well as project) strategy via the form of agendas in companies. This is developing in the form of convention of Social Networks for informally sharing experiences. For its facilitation, there is transparency in organizations with flat hierarchical structure to create open to suggestions environment with open door policy to transform ideas into decisions swiftly.

   On the RM front, organizations strive to update the SWOT analysis at every step/stage of project to align the tasks to the project objectives. There is a common goal that organizations want to achieve which is to conduct RM at project level and KM at organizational level with their optimum collaboration.

2. **Verification of Risks at early stages**

   The interviewees were all in agreement regarding the risks presented in section 5.1. The unavailability of information was considered to be the most prevailing risk source. This is magnified with the risk of inadequate information flow. This requires the organizational and strategic process structures to be pro knowledge sharing with the effect of COP's at inter as well as intra project level. There is a need for similar structures for all projects due to the lack of common framework of reference. This can be facilitated with defined and structured steps for project to facilitate flow of work requiring minimum efforts and instruction, thus reducing 'Reinventing the wheel' while decreasing workload and enhancing profitability.

   There is a prevailing understanding of KM as IM and is dealt under ICT for technical support and KM's human aspects under HR for employee interaction, development, education (training, mentoring and others) which confirms the risk of ineffective linkage systems.

3. **Similarities between KM and RM approaches**

   On the likenesses front, both KM and RM use gatherings in the form of Kick off meetings for ice breaking with project teams, internal stakeholders, external consultants, contractors and others. Both the domains necessitate the need for considering all the stakeholders as strategic partners. Both require the implementation of KM support systems rather than just their creation with the freedom at individual levels for making decisions. There is basic need to enhance the knowledge acceptance and dissemination in all directions to enhance efficiency: 'Vertical as well as Horizontal' at the project as well as the organizational level for both the domains.

4. **Suggestions for integration of KM into RM**

   It has been recommended by majority of interviewees that at the project level, cooperation with external consultants and partners for 'Benchmarking' is desirable to utilize it for 'GAP' analysis to achieve appropriate knowledge mapping. The usage of concepts like 'Peer Network' for knowledge sharing where young employees discuss and learn from experiences ones can be of benefit at the project as well as organizational level. The recurrent feedback has been of introducing the flexible

approach for managing changes. For this, the project procedures to be made adaptable depending on the size and complexity of project i.e.

- *For SMALL projects*: less rigorous tools, techniques, approaches required, personalized templates and formats, individual level decision making etc.
- *For BIG projects*: specialized and standard tools, techniques, framework to instigate additional impact and handle complexity, formalized approaches and mutually shared templates and formats

With the findings from the literature review and interviews it is possible to move on to a detailed discussion about the second, third and fourth (last) objective is described in the next chapter.

Chapter-6

Discussion

This chapter provides a discussion of the information in the form of analysed data from the primary as well as secondary sources gathered for the purpose of research. For this the discussion follows the objectives of the research which are dependent on each other and thus follow a sequence. The first objective has been analysed in the last section 5.1. This chapter takes the discussion further by examining the last three objectives.

6.1 KM tools for the early stages

This section examines the risk areas analysed in the section 5.1 and evaluates which of the techniques of KM as mentioned in the literature review can be applied to nullify or lessen the effect of those risks. In so doing, it draws upon the literature review and more information from books and articles (as part of extended literature review). The extended literature review provided the detailed approaches and the methodology to put them into practice. This is essentially the comprehensive form of the concepts already briefed in the literature review. These are provided with acknowledgement to the same sources but even more information added. Suggestions, feedback and learning from the primary data research of interviews is also included and analysed.

1. **Unavailability of information:**

   This is the critical risk source and can be dealt with by utilizing the appropriate KM techniques. The first and foremost step is organizing a *Brainstorming* session. This benefits the organization as well as the project team by pondering upon the problematic situation taking the minds off the normal work situation (Maylor, 2010). This acts as a medium for sharing *Best Practices* among the project team thus leading towards the incorporation of the *Lessons Learnt* into current strategies via the capturing and usage of *Past Experiences* (Farias, et al., 2003). This is based on the concept of Case-Based reasoning which relates the new problem with a previous similar situation and uses the information and knowledge of that situation basing the solution on it (Artto, Kähkönen, & Pitkänen, 2000).

   Apart from this, information can be congregated by making use of 'Cross-project' (Artto, et al., 2000) learning through people transfer, not just knowledge transfer. As found in the interviews, this way new thoughts and ideas come into existence which may have been lacking due to the aligned thinking of the project team. This can also assist in the utilization of organizational knowledge database (repositories of knowledge in the form of files, reports and other documents) which has been formed for this purpose and result in *Leveraging the Intellectual Assets* in the form of *Knowledge Maps.* These tools are summarized in Figure 6.1.

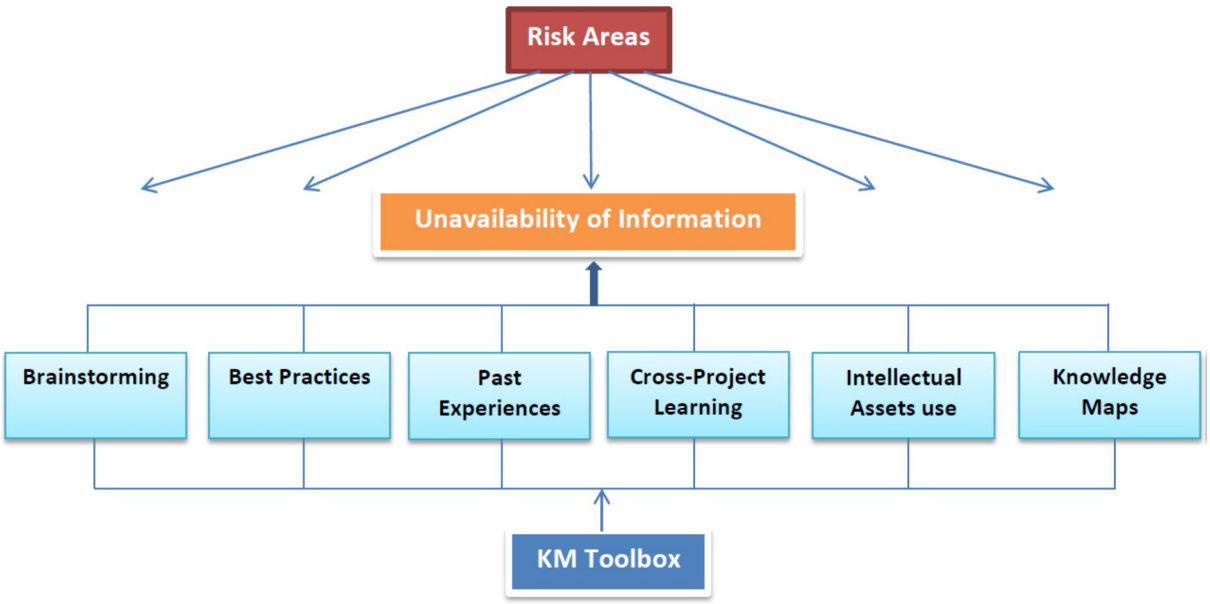

Figure 6.1: KM tools for Unavailability of Information

2. **Absence of a mutually defined context:**

   Organizations require four interacting elements namely task, people, structure, technology which entail synergy among them (Boddy, 2002). Here the task and people are the most important as the organizational structure is quite different from the project but depict pseudo organizations. The project is started with the existing organizational context and through formal and informal interactions is developed into a social context which supports the projects objectives (Kalling & Styhre). For this purpose, the *Embedding of knowledge* in products, services, and processes of the project becomes essential.

   As suggested in the interviews, the foremost task is to align the project team and the stakeholders for the project for the establishment of a shared context. This includes the common understanding of the project definition which includes: aim, goals, purpose, objectives, scope (inclusions and exclusions), deliverables, constraints and most importantly the assumptions on which all the estimates are based (K. Zhang, Zhang, & Zhang, 2010). It becomes pertinent to analyse the supposition and decisions taken there forth by the project manager (Farias, et al., 2003). This can be done through *Knowledge fairs* (for stakeholder involvement) which outline the *Best Practices* of the project. The *Workshops* stage the execution of *Brainstorming*

sessions for the understanding of the goals and challenges of the project to form the project objectives which are SMART (Specific, Measurable, Achievable, Realistic, Time oriented) and agreeable by all. This final step is the description and acceptance of the change management process and the procedure to enforce it. The tools for this purpose are summarized in Figure 6.2 below.

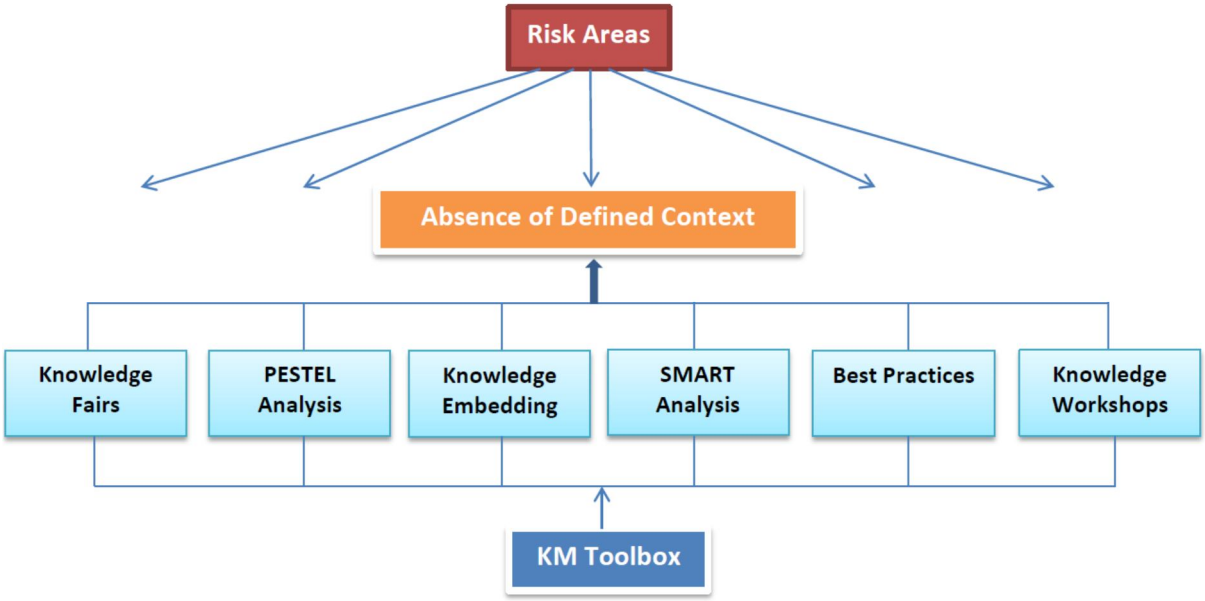

Figure 6.2: KM tools for Absence of Defined Context

3. **Inadequate information flow:**

This pertains to the flow of information among the project stakeholders through the knowledge spiral. The primary task of managing this risk is by instilling the responsibility for *Knowledge Sharing*. This can be done through motivation which could be implemented by the usage of incentives such as *Rewards.* This has the motive of understanding and measuring the value of knowledge. Studies done by Lai and Lee (2007) have found out that a well laid out empowerment system supports and provide a basis for KM leading towards trust which inclines towards the sharing of knowledge (Lai & Lee, 2007). Another recognized method is the method of *After Action reviews* which are utilized for the formation of *Best Practices* built upon the *Lessons Learnt* in previous projects thus providing the inertia for moving the project in the absence of sufficient information.

For the appropriate knowledge flow, there has to be a creation of *Knowledge Database or Repositories* which can be referred to in times of need (Kalling & Styhre). These are all formal approaches to maintain and enhance the course of knowledge. As found out in the interviews, one of the most effective methodologies for knowledge sharing is the formation of *Communities of Practice (COP's).* This concept assists in the process on information sharing via *Storytelling* which helps in transferring tacit knowledge. This informal process leads to the structuring of the formal *Knowledge Maps* which play an essential role as described in the literature review. All these applicable tools are summarized in Figure 6.3 below.

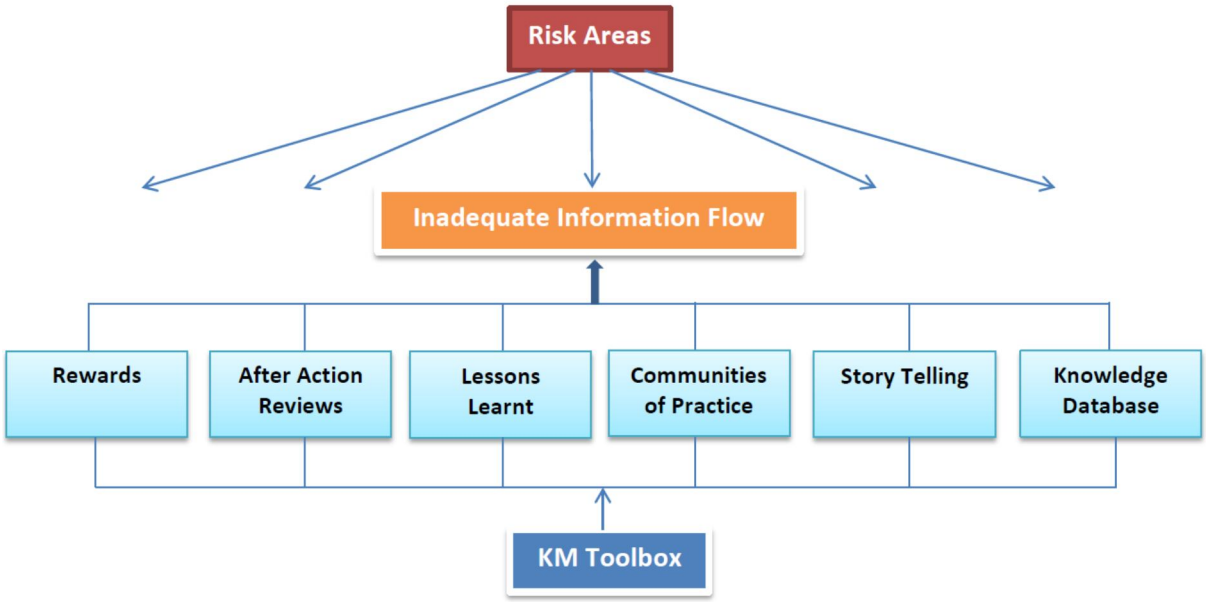

Figure 6.3: KM tools for Inadequate Information Flow

4. **Lack of common framework of reference:**

Different project parts/departments use different methods of managing risk. This introduces incompatibility and poor collaborating on the knowledge front. It is imperative to conform that the strategy adopted for RM is the same all the way through the project (Farias, et al., 2003). The KM technique that works in this situation is the method of *Benchmarking*. This can be done by performing *Knowledge Audit* throughout the project. This outlines the most effective method for dealing with the risks and can thus be suggested to all the departments to follow thereby leading to a common framework which can be used by all to improve and change the course of

action. This can incorporate the qualitative and quantitative tools of RM together to lead to a mutual understanding and evaluation of risks.

Another KM tool which works here is the establishment of *Knowledge Maps* which identify key knowledge areas, in house experts, resources. This way the knowledge and experience assimilated by managers working on the several organization projects can enrich the risk planning (Farias, et al., 2003). As suggested by primary research, this combined with benchmarking (internal within the project and external with the industry) leads to the formation of latest methods which are more effective in dealing with the risks in a better way how and where they can be found at. The tools for this purpose are summarized in Figure 6.4 below.

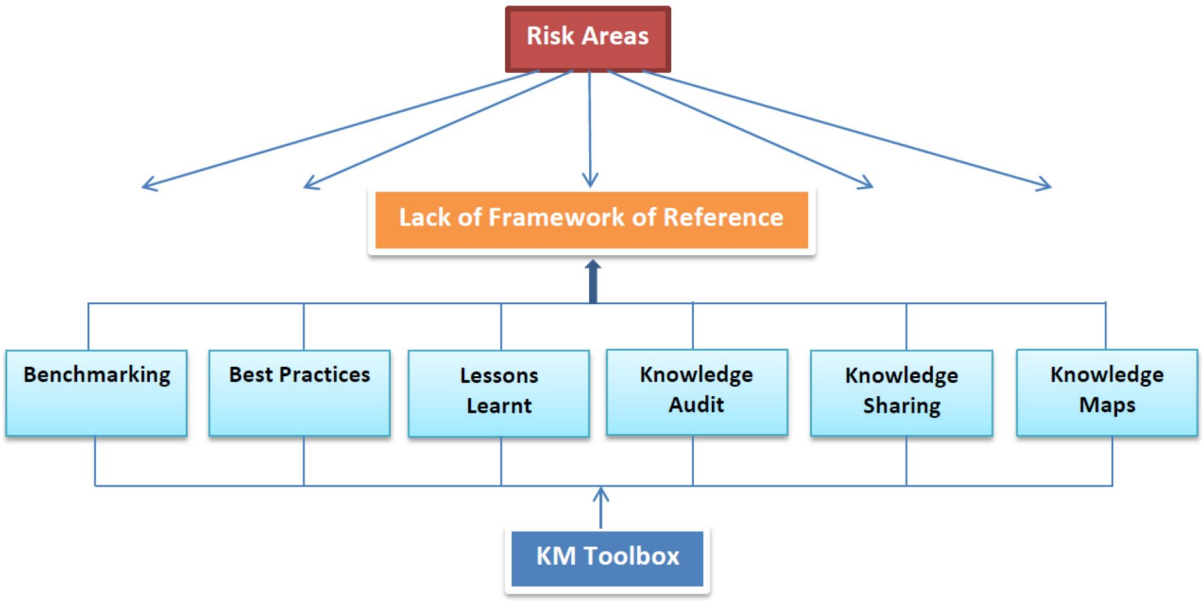

Figure 6.4: KM tools for Lack of Framework of Reference

5. **Ineffective linkage systems:**

   All the information and knowledge on the project has to be connected to enhance its worth. The best KM technique for this is the establishment of the *Knowledge Maps* which connect the knowledge sources with each other. Knowledge maps represent node-links where information is situated in nodes and connected to other related information via a sequence of labelled links (O'Donnell, Dansereau, & Hall, 2002). These node-links are found out using the *Knowledge Audit*. For the external knowledge, the building and mining of customer knowledge bases becomes essential.

This assists in the process of *Embedding the information and knowledge* in the project products, services, and processes. Other supporting KM techniques include the concept of delegating designations such as *Knowledge workers*, *CKOs* (Chief Knowledge Officers), *Knowledge brokers* (individuals acting as a reference for information on specific topics, fields or subjects) and others.

The structures in terms of the ICT systems are a necessary medium for managing project risk knowledge although they are not sufficient on their own without the human interface. These systems solve the purpose of linking the knowledge areas by making use of *Collaborative Technologies* (groupware, etc.), by means of *Social Software* (wikis, social bookmarking, blogs, etc.) and others. With the advancement of technology, some authors advocating the usage of framework that supports the automation of some key steps of RM linked to decision making thus leading risk response planning simpler, faster, and more accurate (Wickboldt et al., 2011). This is based on the concept of using the historical knowledge (information from previous projects) and basing the decisions on it by linking and finding out the similarities between the current and the previous risks and the methodologies used to deal with them. This can prove beneficial if implemented appropriately. All the applicable tools for this purpose are summarized in Figure 6.5 below.

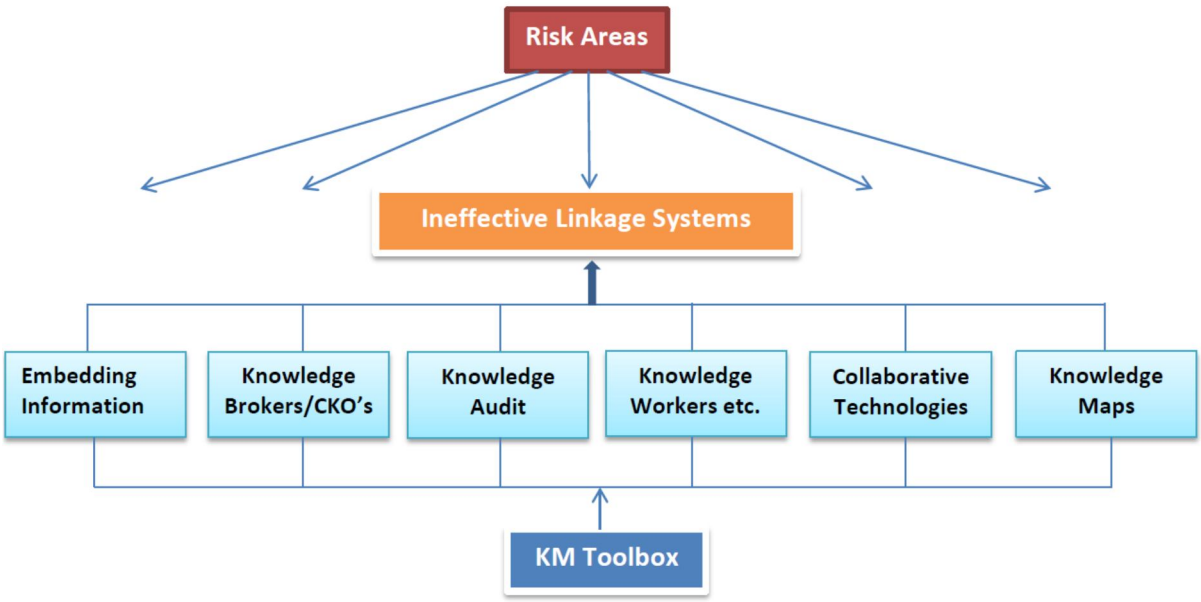

Figure 6.5: KM tools for Ineffective Linkage Systems

6.2 Similarities between KM and RM

As the risk sources that threaten the project in the early stage have been analysed with the usage of KM tools and techniques, the discussion now moves to the next step where the similarities between the approach of KM and RM are examined. This section utilizes the extended literature review of KM for its tools and techniques and the learning from last section which has already incorporated the suggestions from the interviews. The various factors and categories of similarities have been analysed and are described below with the description and explanations:

1. **Knowledge Accumulation:**

   The aim of KM is to seize information and transform it into operational knowledge that can be applied and put into practice. Its purpose is to sustain and grow the organizational competencies by capturing the explicit as well as tacit aspects of knowledge (APM, 2006). KM solves the purpose of acquisition of knowledge by exploring existing knowledge, understanding requirements and searching through multiple sources. RM solves the same purpose but under the context of risks. All the mentioned tenacities of KM are also unravelled by RM using similar tools of brainstorming and others. Discussion using meetings forms one of the significant parts of RM (PMBOK, 2008).

2. **Knowledge Dissemination:**

   KM thrives to effectively disseminate knowledge both in time and through space across the organization and all the stakeholders. RM provides analogous provisions for documentation, analysis and communication in the form of risk register (Neef, 2005; PMBOK, 2008). The dissemination deals with the dispersal of existing information via the conversion of data to information and then to knowledge for sharing (APM, 2006). Both KM and RM are dealing with uncertainty (Emblemsvåg, 2010), performance monitoring and control (Neef, 2005) and focus on achieving competitive advantage (K. Zhang, et al., 2010). Both thrive to deliver systems, infrastructure and processes to support activities and decision making (Neef, 2005) to back knowledge distribution with the modern day concept of real time assessments (Arrow, 2008). Moreover, RM keeps track of the lessons learnt for future needs (Massingham, 2010; PMBOK, 2008) which is a concept shaped by KM.

3. **Knowledge Reprocessing:**

   KM recycles knowledge by efficiently re-using knowledge created at different times and locations. This involves applying or making use of existing knowledge for a novel purpose as confirmed by the primary research. Both KM and RM are used for collection and interpretation of data and information (Jones, 2005), creation and management of knowledge (Jones, 2005), integration and utilization of knowledge for decision making purposes (Emblemsvåg, 2010; Jones, 2005; Massingham, 2010).

   The knowledge used may be from a previous context but with the new application new knowledge is created. Both focus on the management of information quality and discarding of the irrelevant to avoid heaps of scrap (Emblemsvåg, 2010; Kutsch & Hall, 2010). In cooperation, both thrive to acknowledge the users' experience and put into words the suppositions and analyse them to avoid formation of gaps which lead to flawed decisions (Farias, et al., 2003).

4. **Collaboration:**

   This pertains to the collaboration at the human as well as the technological/process front. One of the objectives of KM is to instigate the sense of effective collaboration among the members of project groups and across all the individual groups. Similar is the situation where the processes of RM work together with each other in addition to those of other knowledge areas (PMBOK, 2008). Both analyse the current processes for the identification of gaps (Jones, 2005) and align it to the strategic project objectives (APM, 2006; Jones, 2005). These processes interact and overlap with other PM processes (PMBOK, 2008). The concept of stakeholders with their analysis and proper communication between them through robust channels is understood and necessitated by both (Arrow, 2008).

5. **Problems faced:**

   There are also similarities on the problems faced front. The key categories scrutinized by the research are outlined below:

   1. ***Obsolescence:*** KM and RM both deal with information which becomes obsolete as soon as it is generated. The timely reach of this changing information to the appropriate user is an issue for both the domains.

2. ***Overloading:*** There is a pool of information that is collected and a large part of it is irrelevant which necessitates removal to avoid overload. This otherwise makes it difficult to acquire useful and appropriate information for usage.

3. ***Technology:*** Both the fields face restricted applications on the technological front. Technology acts as an essential tool but the whole emphasis cannot be laid on it. Too much reliance on technology can prove fatal as it is just a facilitator of the purpose not its core.

6.3 Integrating KM and RM

This last section of the discussion chapter explores and investigates the means of incorporating the KM approach to the one used by RM. This is accomplished by analysing the tools and techniques of RM used and the strategies and approaches of KM. For this, the similarities found out in the previous section and the information received form the interviews are utilized. The discussion here is conversed from four viewpoints namely: the people's perspective, the structural viewpoint, the context outlook and the technological standpoint and deliver suggestive measures to enhance the collaboration of KM and RM and their effectiveness along with efficiency.

1. **The people's perspective:**

   The primary research suggests that the foremost objective at the project initiation ought to be to instigate the feeling of shared and aligned vision among the project leaders and management to gain consistent support from all levels. This assists in the identification of the stakeholders' major requirements, foremost expectations and their potential influence (PMBOK, 2008) which can then be aligned with the project objectives. The information then needs to be communicated to anticipate and address concerns to implement solutions that relates to every person of the project team. Moreover it assists in dealing with possible bias due to cultural differences arising due to working in different contexts.

   One of the causes for poor knowledge sharing has been due to the controversial topic of reward systems. This is due to the fact that the person with the knowledge is rewarded and acknowledged rather than the one who shares it dictating emphasis on

the individual knowledge rather that the collective. Knowledge mapping indicates the knowledge gaps when these possessors of knowledge leave the project. Thus appropriate rewarding schemes can create an information sharing environment where the collaborative efforts to contribute to and share knowledge are encouraged and rewarded.

Regarding the sharing and flow of information, it should be a continuous dynamic process controlled according to the needs of the end users. To enhance efficiency, Knowledge acceptance and dissemination should be in all directions 'Vertical as well as horizontal' at the project as well as the organizational level. Ideally, this should be a two-way process which incorporates both input contributed as well as the retrieval. But the information sharing and managing culture does not work in isolation, so it necessitates such assisting systems along with the policies which support and enhance it (Ringel-Bickelmaier & Ringel, 2010).

The continuing global collaborative research efforts at WHO has acknowledged several "push" factors which recommend to deliver a tailored approach to target stakeholders, credible envoys of information, "pull" factors which provide access to searchable databases using latest information technology and exchange activities to build and maintain associations (WHO, 2006).This creates an environment of problem solving and optimized planning leading to the implementation of effective RM solutions. For this the usage of concepts like *Peer Network* for knowledge sharing where young employees discuss and learn from experienced ones can prove beneficial. This can work in parallel with COP's at inter and intra project level and social networks for informally sharing experiences. Finally, cooperation with external consultants or partners for *Benchmarking* can also assist in the comparison of RM practices which can be utilized for *Gap Analysis* to achieve appropriate knowledge mapping. The concepts for integrating KM into RM from this perspective are summarized in Figure 6.6.

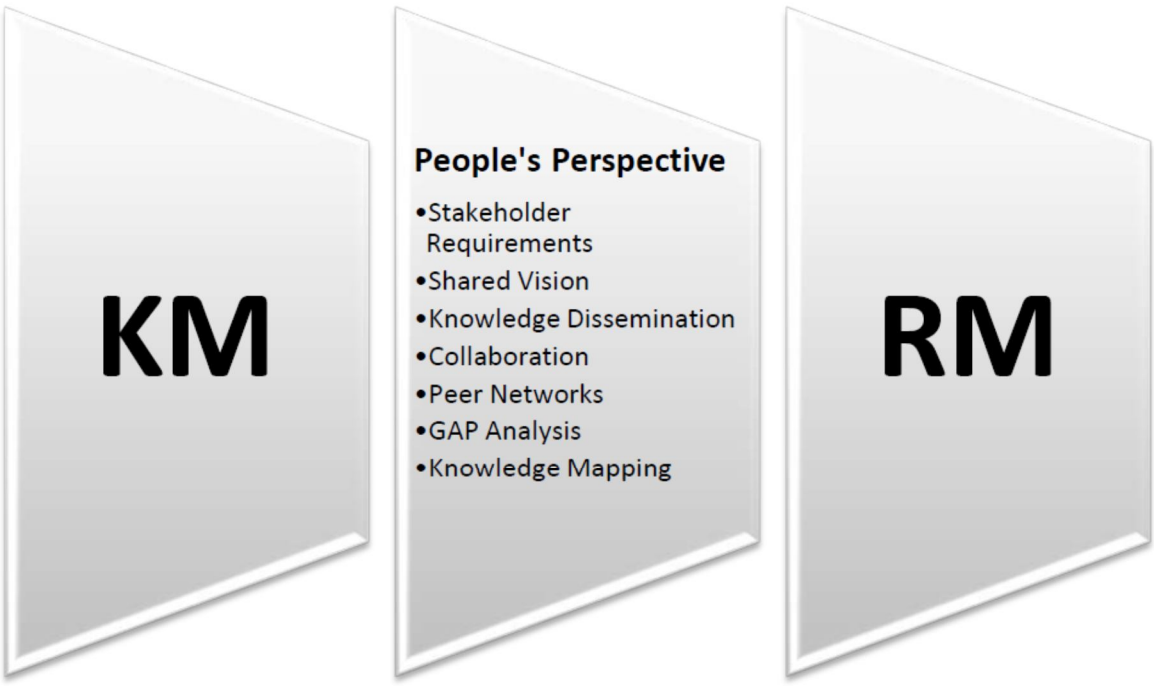

Figure 6.6: Concept for Integrating KM into RM- the People's Perspective

2. **The context outlook:**

   As the project provides ground for learning, the information exchange should be instigated at the earliest stage which necessitates a shared context. KM via knowledge sharing can facilitate a platform for dialogue and exchange in the form of an organizational context which is held up by anonymity and exclusivity (Kalling & Styhre) to deal with risks. The context is a major issue as it influences the interactions of people and is itself influenced by the people (Boddy, Boonstra, & Kennedy, 2009) which can assist RM.

   As context cuts through the internal and external environments of the organization, any variation in it can make managing of the project challenging which may support or hamper the realization of its objectives, deliverables and benefits. Therefore the context ought to contemplate the sensitivity and understanding of the concern and influence of all stakeholders which it is based upon (APM, 2006). This issue of RM can be facilitated by using the appropriate tools of KM as mentioned in the section 4.3. Although the extensive diffusion of knowledge necessitates it to be context-free, it again has to be reinterpreted via KM approaches to make it specific to the context to

implement it to suit particular circumstances (Bresnen, Goussevskaia, & Swan, 2004) of RM. As conveyed by the interviews, Kick Off meetings for ice breaking, as part of the KM procedure, with project teams, internal stakeholders, external consultants, contractors and others with the effect of considering them as strategic partners can resolve this concern. For their optimum collaboration, as advocated by the primary research, RM should be done at project level and KM at organizational level with the SWOT analysis at every stage of project. The concepts for integrating KM into RM from this perspective are summarized in Figure 6.7 below.

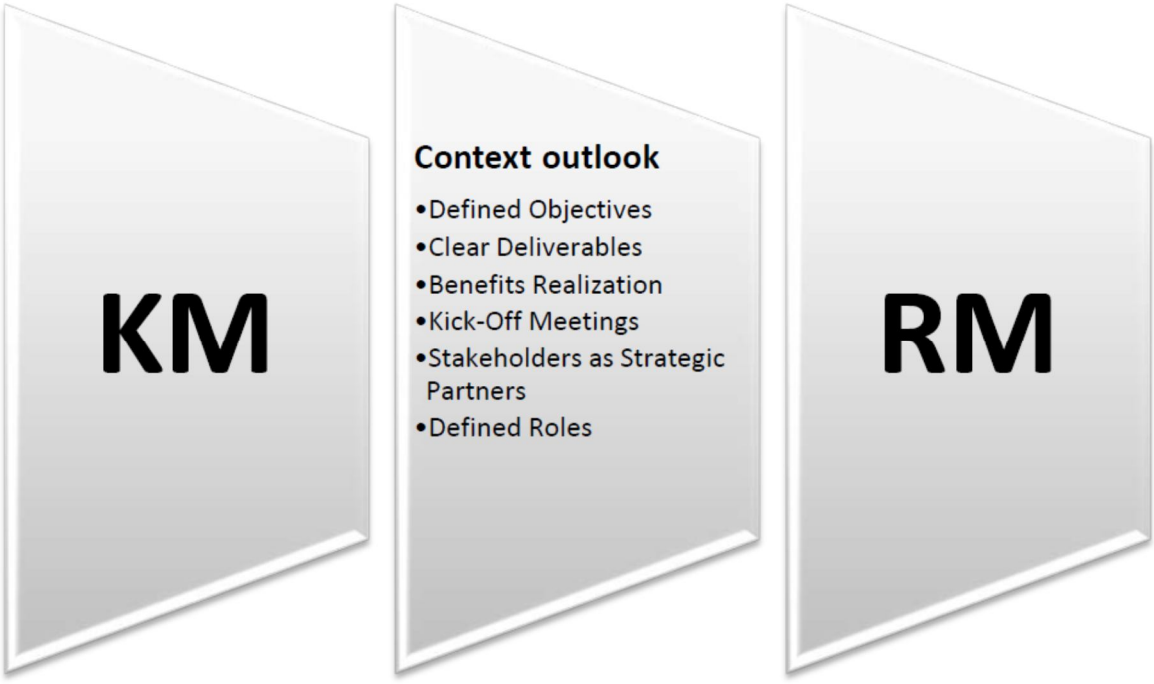

Figure 6.7: Concept for Integrating KM into RM- the Context outlook

3. **The structural viewpoint:**

This pertains to the framework and organizational structures at place for assisting the KM and RM processes which need to be pro knowledge sharing. A collective framework for the project improves the degree of standardization which defines and makes the project roles, deliverables, roles, responsibilities, procedures clear (Binder, 2007) and makes the risk areas apparent to deal with them. The objectives of RM can be accomplished easily if this framework is integrated. This integration helps in the identification of novel frameworks. This can be accomplished by the creation of a

project office. The Project Office as part of organizational structure offers assistance and support to clients and stakeholders, including briefings, consultation sessions, presentations and workshops (UN, 2010).

The United Nations Industrial Development Organization paper on RM in one of its projects suggests that most of the issues arising at the identification stage can be resolved and alleviated through enhanced information while applying improved consistent approaches to project RM (Kleindorfer, 2011). This can be done if RM is implemented at project level and KM at organizational level with their optimum collaboration along with the project procedures which are adaptable depending on the size and complexity of project.

The task managers at the World Bank Group strive to attain applicable and methodical means to utilize information management practices to mitigate risks by accountability mechanisms and firming control (Baldeon & Arribas-Baños, 2008). This can be made proficient by using consistent standards and templates to improve knowledge content quality. The content may be in the form of defined and structured stages with common framework of reference for project to facilitate flow of work requiring minimum efforts and instruction thus reducing 'Reinventing the wheel' decreasing workload and enhancing profitability.

Another one of the solutions is the checklists or risk registers which act as 'living documents' (Antvik & Sjöholm, 2007) which become extensive and broad with the passage of time as a result of dynamic information feedback. Additionally, to facilitate the implementation of RM, development of activities to interchange ideas within teams and with other teams to reach conclusions by providing motivation and openness to the reception of different views is necessary (Rodriguez & Edwards, 2009).

In the authors view, one solution is to streamline and simplify the process of information review to weed out risks. This necessitates simple, effective processes and systems to make new informational data and content available to the end user as early as possible thus reducing bottlenecks which make the knowledge base more relevant, valuable, updated and convenient which makes it easier to evaluate, refine,

accelerate and perfect the information and content creation process. The concepts for integrating KM into RM from this perspective are summarized in Figure 6.8 below.

Figure 6.8: Concept for Integrating KM into RM- the Structural Viewpoint

4. **The technological standpoint:**

   Technology plays a major role but as mentioned in the literature review, it is not exhaustive on its own. It works along and fosters networking among the team members working in for RM. This could be in the form of establishing functions for COP's, developing learning environments for strategic development enabled with inter/intranet, tools for information sharing, self-learning, servers for common pool of knowledge input and output, knowledge exchange, development of techniques for enhancing collaborative approach to problem solving and others.

   These concepts can then be matured to become the features of KM which assist RM customized to the organizational structures and the extent of the ICT tools available (Ringel-Bickelmaier & Ringel, 2010). These solve the purpose to promote collaboration, transparency and open access to information resources for sustainable project progress. As suggested in the interviews, the main focus should be on the

implementation of KM support systems rather than just on their creation. The concepts for integrating KM into RM from this perspective are summarized in Figure 6.9 below.

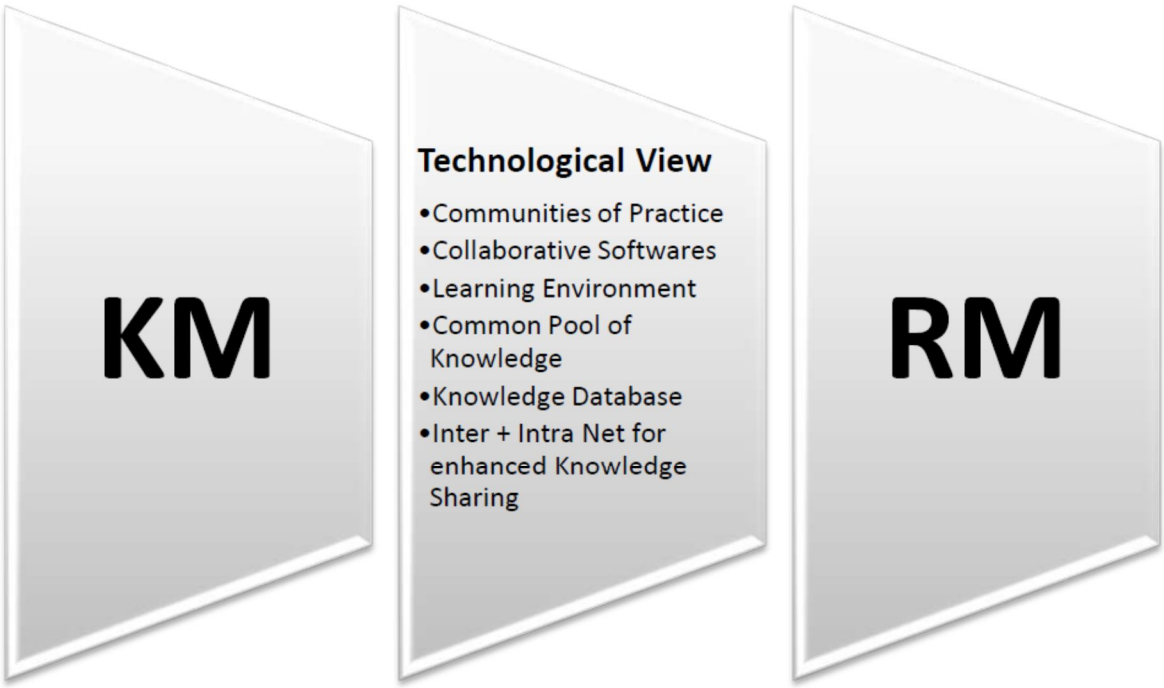

Figure 6.9: Concept for Integrating KM into RM- the Technological View

Chapter- 7

Conclusion

This chapter provides the final conclusion of the study. This is put into sections which describe the study by delivering the practical implications of the study, the limitations and the recommendations for future further studies in the field.

7.1 Fulfilment of Research Aim

The research has reviewed and examined the approaches of RM and KM and analysed with a critical perspective how these two distinct domains of PM can be combined to benefit each other right from the early stages of the project. The aim of the research is accomplished in terms of the investigation of the extent to which the tools and techniques of KM can be applied to the processes and procedures of RM used in the early stages of projects. This has been verified and the extent has been shown to be very high with the examination and suggestions to effectively implement them for improving current RM practices. The aim has been accomplished by achieving all the four objectives that were laid down in the beginning of the research which are described in the next section.

7.2 Fulfilment of Research Objectives

The scope of the research was made clear and precise with breakdown of the aim into defined objectives. This facilitated the in-depth analysis and thorough investigation of each of the objectives while making use of the primary as well as the secondary research. The realisation of each of the objectives is presented below.

The first objective was to identify the sources of risks present in the early project stages. This has been examined through the extended literature review by analysing the reports and papers of international organizations the results of which were confirmed through primary research in the form of interviews with experienced personnel from diverse project based organizations. The primary as well as secondary data was analysed through a rigorous methodical process as explained earlier. This explicitly identified the sources of risks present in the early project stages which are: Unavailability of information, absence of a mutually defined context, inadequate information flow, lack of common framework of reference and Ineffective linkage systems. These risk areas show direct association with KM.

The second objective was to identify and examine the tools and techniques of KM which can be used in the early project stages. With the risks hindering the projects at the very early stage made apparent through the literature review as the secondary research with the verification through the primary research, Section 6.1 provided a discussion over the various tools and techniques of KM which were briefed in the literature review. This delivered an analysis over

which of the tools and techniques could potentially be utilized for each of the identified risks in order to deal with and lessen the effects of the threats underlying the risks. It was concluded that the tools of KM fit the processes of RM with particular attention to the threats.

The third objective was to explore the similarities between KM and RM tools and the conditions under which the KM techniques can be applied to RM. This was followed up by again utilizing the points raised in the previous section and determining the areas in which the two domains showed similarities. The similarities have been found on different fronts which include knowledge accumulation, knowledge dissemination, knowledge reprocessing, collaboration and even the problems faced. This provided an overall understanding that the two domains were being used for the same purpose but the only difference was of the context in which they were applied.

The fourth and the last objective was to analyse the means of improving the tools and techniques of RM used in the early project stages by utilizing the strategies and approaches of KM. This section scrutinised the objective by segmenting the propositions into four sub-sections. These sub-sections provide suggestions based on the learning form the literature, the reports as well as the interviews describing the recommendations from the people's perspective, the context outlook, the viewpoint of organizational structure and the technological point of view.

7.3 Practical implications

The research has conveyed conceptions into the understanding of two diverse domains of PM which are now linked together through the study. It has provided an understanding to how the embedding of KM into RM can develop its implementation. The collection of primary data form diverse fields of PM makes the outcomes of the research applicable to all project based organizations. The findings consequently can be used by practitioners dealing with and working in the fields of KM and RM. In the academic sphere, this can be advanced to theorise standard processes and tools for KM and RM incorporation in the form of an elaborate research through alliance between university researchers and management professionals.

7.4 Limitations

The scope of the study, due to time restrictions of the M.Sc. dissertation, has been limited to the investigation of the early stages of the project only. As the literature review of both the domains of RM and KM is comprehensive and incorporates all the stages, the study can be taken from that point onwards and thus can be utilized for investigation of later stages. This requires only the assortment of additional data and information from primary research which is relevant and linked to those stages. The collection of more reports and publications form the private sector can lead to the formation of more concepts that can be applied to that sector. This private sector information was not incorporated in the current research due to the confidentiality of these documents which restricted their use in the research.

7.5 Future Research

To the best of author's knowledge, the research represents one of the first attempts to find similarities between these two domains of PM and their mutual collaboration and takes the research of PM one step further thus paving path for future studies. The study has pointed out areas in which this research can be extended for finding additional profound relations between RM and KM. As shown in the discussion, ideally RM and KM executed together provides a robust base for the project in dealing with the risks. Thus new approaches and techniques with additional tools and techniques using latest technological advances, which incorporate the strategies of both, can be defined and structured for connecting all aspects of both domains for its development.

Finally, it can be concluded that a company cannot manage its risk effectively unless it manages its knowledge. Successful integration of KM and RM can be achieved through a balanced assortment of technology, effective processes of work and adaptive mind set of people. The whole project process including the project-based working practices needs a paradigm shift of thinking. Ultimately, the essence of the entire issue is *How can I know what I don't know I know?*

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Appendix

Interview Template

Interviewer: *Date:*

Interviewee: *Present Designation:*

Experience (years): *Organization:*

Segment 1

Objective *- to understand the level of KM and RM in the organization and the tools used*

1. **How mature are the Knowledge Management (KM) practices in your organization?**

   A. Early stage

   B. Introduction stage

   C. Growth stage

   D. Highly developed stage

2. **In what way would you characterize how KM is looked upon in your organization?** ***(Multiple options may be chosen)***

   A. Something that is already being done but not under the same name

   B. Something which is considered as a management fad

   C. It has been incorporated into the strategic part of our business

   D. Others, please specify

3. **Regarding policies and strategies, your organisation:** ***(Multiple options may be chosen)***

   A. has a written KM policy or strategy

   B. has a value system or culture intended to promote knowledge sharing

   C. has policies or programmes intended to improve worker retention

   D. uses partnerships or strategic alliances to acquire knowledge

   E. Others, please specify

4. **To what extent are the below mentioned tools, techniques or methods does your organization utilize for KM?** *(Level of magnitude: 1. Negligible, 2. Low, 3. Intermediate, 4. High, 5. Very High)*

   A. Communities of practice

   B. Knowledge database without the use of technology

   C. Knowledge database making use of ICT

   D. Lessons learnt

   E. Brainstorming

   F. Knowledge mapping (keeping track of who knows what)

   G. Benchmarking

   H. Best practices

   I. Storytelling

   J. Rewards

   K. Delegating designations such as knowledge workers, CKOs

   L. Others, please specify

5. **To what extent are the below mentioned tools, techniques or methods does your organization utilize for RM?** *(Level of magnitude: 1. Negligible, 2. Low, 3. Intermediate, 4. High, 5. Very High)*

   A. PESTEL

   B. SWOT

   C. Risk catalogue/register

   D. Group discussions

   E. FMEA (Failure Mode and Effects Analysis)

   F. Decision tree analysis

   G. Event tree analysis

   H. Fault tree analysis

   I. Risk Probability and Impact Assessment

   J. Probability and impact matrix

   K. Cause-Consequence Analysis

   L. Risk Urgency Assessment

M. Monte Carlo analysis

N. Sensitivity analysis

O. PERT (Program Evaluation and Review Technique)

P. Risk data quality assessment

Q. Modelling and Simulation

R. Others, please specify

Segment 2

Objective *- to verify risks of the early stages as brought into being by the research and analyse their depth*

6. **What is the degree to which the below mentioned sources of risks affect your organization right from the early stages?** *(Level of magnitude: 1. Negligible, 2. Low, 3. Intermediate, 4. High, 5. Very High)*

   A. Unavailability of information

      a. Slow process of knowledge gathering and generation

      b. Lack of and poor access to relevant information

   B. Inadequate information flow

      a. Poor sharing of knowledge in the organization especially with stakeholders and project team members

      b. Lack of effective communication between producers and users of information

      c. Reinventing the wheel

      d. Projects disconnected on the information distribution front

      e. Complex organizational structure limiting inter departmental collaboration

      f. Restricted information transfer due to organizational barriers

   C. Absence of a mutually defined context

      a. Diverse interpretations of information

      b. Different needs and assumptions of the diverse stakeholders

   D. Lack of common framework of reference

      a. Absence of a common framework for knowledge transfer

      b. Lack of consistency in processes for RM across departments/teams

c. Limited integration of quantitative and qualitative methods for RM analysis

E. Ineffective linkage systems

a. Inadequate information and network systems

F. Others, please specify

Segment 3

Objective *- to understand the interviewee's perspective on the similarities between the KM and RM and confirm the ones found in the research*

7. What is your perspective on the similarities between the approach and techniques of KM and RM?

A. Both focus on capturing, acquiring and creating information and knowledge

B. Both emphasize on sharing and disseminating knowledge throughout the organization

C. Both stress on re-using/applying existing knowledge to the full extent

D. Both concentrate on collaboration for solving the problems

E. Other, please specify

Segment 4

Objective *– to receive the interviewee's feedback for the integration of KM into RM (open ended)*

8. In your view, what is the scope of incorporating KM tools/techniques into RM tools/techniques?

9. Suggestions for improvement of both RM and KM and their mutual functioning.