An Empirical Analysis of Project-Based Learning

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ABSTRACT

As the world economy becomes more complex, the most competitive organizations will be those that continually acquire, retain, transfer, and apply knowledge. Researchers and practitioners recognize that the ability to manipulate knowledge and learn from experience is imperative for organizational survival. In addition, many organizations are increasingly adopting project-based forms of organizing to increase flexibility, innovation, and manage the fast pace of change. However, extant literature shows that there is limited diffusion of the knowledge generated within projects beyond the people involved in a particular project and its end date. This immobility of experiential knowledge leads to duplication and repetition of past mistakes. We must therefore understand how project-based organizations can access, sustain, distribute and leverage lessons learned to generate value. This study examined the learning practices used to acquire, retain, and transfer knowledge from projects based on reflections and perspectives of 25 participants from two small project-based organizations in Uganda. Data was collected from semi-structured interviews, supplemented by analysis of project documents. Results of the study show that project-based organizations learn by adopting a combination of learning practices, including lower order experience accumulation through repetition of task routines and higher order knowledge articulation through dialogue and negotiation, and knowledge codification through knowledge manipulation and inscription. The effectiveness of these practices is influenced by certain conditions in the local project-based organization's context which may present barriers to project-based learning of personal, organizational (culture, process, technology, organizational characteristics) or knowledge (tacit, explicit, transferability) types. Unless the barriers are addressed, the current practices-in-use cannot support a successful learning strategy for either of the organizations studied. This study suggests a framework to recognize barriers to project-based learning in a given setting, based on the limitations of current learning mechanisms identified by practitioners in that setting. The study also suggests means to address these barriers and build successful learning strategies.

RÉSUMÉ

Comme l'économie mondiale devient plus complexe, les organisations les plus compétitives seront celles qui acquièrent continuellement, conserver, de transférer et appliquer les connaissances. Les chercheurs et les praticiens reconnaissent que la capacité de manipuler les connaissances et apprendre de l'expérience est impératif pour la survie de l'organisation. En outre, de nombreuses organisations adoptent de plus en formes basées sur des projets de l'organisation pour augmenter la flexibilité, l'innovation et gérer le rythme rapide des changements. Cependant, la littérature existante montre qu'il ya diffusion limitée des connaissances générées au sein des projets au-delà des personnes impliquées dans un projet particulier et sa date de fin. Cette immobilité des savoirs d'expérience conduit à la duplication et la répétition des erreurs du passé. Nous devons donc comprendre comment les organisations basées sur des projets peuvent accéder, de soutenir, de distribuer et de leçons de levier appris à générer de la valeur. Cette étude a examiné les pratiques d'apprentissage permettant d'acquérir, de conserver et de transfert des connaissances des projets basés sur les réflexions et les perspectives de 25 participants provenant de deux organisations basées à petit projet en Ouganda. Les données ont été recueillies à partir d'entretiens semi-structurés, complétés par l'analyse des documents de projet. Les résultats de l'étude montrent que les organisations axées sur les projets apprennent en adoptant une combinaison de pratiques d'apprentissage, y compris inférieure expérience accumulation des ordres par la répétition des routines de tâches et supérieur articulation de la connaissance de l'ordre à travers le dialogue et la négociation, et la codification de la connaissance par la manipulation de la connaissance et de l'inscription. L'efficacité de ces pratiques est influencé par certaines conditions dans le cadre de l'organisation axée sur les projets locaux qui peuvent présenter des obstacles à l'apprentissage du personnel, organisationnel (culture, de processus, de la technologie, les caractéristiques organisationnelles) ou la connaissance (tacite, explicite, transférabilité) par projet les types. Sauf si les obstacles sont abordés, les pratiques d'usage courant ne peuvent pas soutenir une stratégie de réussite de l'apprentissage pour l'une des organisations étudiées. Cette étude suggère un cadre de reconnaître les obstacles à l'apprentissage par projet dans un contexte donné, sur la base des limites des mécanismes actuels d'apprentissage identifiés par les praticiens dans ce cadre. L'étude suggère également des moyens pour surmonter ces obstacles et construire des stratégies d'apprentissage efficaces.

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This work is dedicated to my boys

Israel and Enoch

"Reach high, for stars lie hidden in your soul." – Pamela Vaull Starr

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CHAPTER 1: INTRODUCTION

This dissertation is a report of a retrospective, exploratory study of how project-based organizations learn. The study was primarily based on personal interviews with twenty five project team members from two organizations. Study participants shared their experiences and perspectives on the practices they used to acquire, retain, and transfer lessons learned from one project to another. This first chapter of the dissertation presents the background of the study, specifies the problem, describes its significance, and presents an overview of the methodology used. The chapter also presents delimitations of the study, defines some of the key terms used, and concludes with a structure of the dissertation.

1.1 Background

Projects may be described as temporary work structures that are constituted by teams within or across organizations to accomplish particular tasks under time and resource constraints (Manning, 2008). These temporary work structures have been used in business since after World War II. The use of projects emerged out of a belief that forming a project team "fosters speediness, short-term efficiency, market agility and customer focus" (Ruuska, 2005, p. 1). Based on Lampel and Shamsie's (2003) diagnosis of the "evolutionary stagnation in the craft of making movies that resulted when older craftspeople with knowledge of working together with other craftspeople within a hierarchy retired from the industry" (Taylor & Levitt, 2005, p. 3), many companies sought to avoid this loss of knowledge by reorganizing their work efforts around projects. The use of projects as a primary means of doing work has since spread into pharmaceutical, biotechnology, healthcare, commercial business, software, new media, and other industries (Taylor & Levitt, 2005).

Increasingly, projects are used to accomplish specific tasks (Rubery et al., 2002), increase flexibility (Ayas & Zenuik, 2001; Sauer et al., 2001), manage change (Zeng et al., 2008) and generate/leverage knowledge (Bartsch et al., 2013). Due to their transience and interdisciplinary nature, project ventures are likely to be very suitable for creating knowledge in the context of its application (Gann & Salter, 2000; Hobday, 2000; Grabher, 2004; Scarbrough et al., 2004). However, the temporary nature of projects seems to inhibit the sedimentation of knowledge. For example, when a project team disbands at the end of a project, members' collective knowledge is

likely to be fragmented and lost, if not captured (Cacciatori, 2008; Grabher, 2004; Ibert, 2004). In addition, "knowledge and experiences gathered in different projects are not systematically integrated into the organizational knowledge base…" (Schindler & Eppler, 2003, p. 219). Thus, one of the crucial challenges for project managers and practitioners is how to successfully capture and transfer knowledge created in completed projects to other projects and to the wider organization (Schindler & Eppler, 2003).

Project-based learning (the acquisition of knowledge within project ventures, and the codification and transfer of that knowledge to an enduring environment (Prencipe & Tell, 2001), has been identified as one of the hot issues in project management literature, fueled in part, by the increasing importance of managing knowledge for organizational success (Antoni, 2003; Sense, 2007; Bakker, 2011). Knowledge is widely recognized as a key performance driver in organizations (e.g., Davenport & Prusak, 2000; Chuang, 2004; Argote & Ingram, 2000; Chou et al., 2005); its acquisition, transfer and application can propel innovation, growth, and development. Organizations that manage their knowledge assets stand to gain considerable benefits including: improved work performance (Arthur & Huntley, 2005), increased efficiency in problem solving (Kamara et al., 2002), higher innovativeness (Lichtenthaler, 2009), reduced risk and cost savings (Hanisch et al., 2009), increased market share (van Wijk et al., 2008), higher productivity (Fuentelsaz et al., 2009), and enhanced organizational competencies leading to a sustainable competitive advantage (Hanisch et al., 2009; Brady & Davies, 2004).

Project-based learning involves collecting knowledge from completed projects, transferring and applying this knowledge to other projects and across the wider organization. While projects are the locus where knowledge creation takes place, the overall process of learning in project-based organizations involves the subsequent transfer, retention and use of this knowledge (Bartsch et al., 2013). In other words, to generate value, project knowledge has to be shared and used. The prospect of re-using lessons learned from project experiences is especially attractive to project-based organizations, since it offers the possibility of more resource-effective problem solving routines and work practices (Scarbrough et al., 2004). Researchers have emphasized the crucial role that project knowledge accumulated across a consecutive series of projects plays in enhancing the performance of organizations; they placed continuous learning and knowledge accumulation at the very center of organizational-level competitiveness (e.g., Anbari et al., 2008; Kotnour & Vergopia, 2005; Soderlund, 2005).

In spite of the benefits, project-based organizations are not conducive to learning compared to their classically organized counterparts. In the classical organization, knowledge is owned and maintained in the functional hierarchy. These functions provide people with careers and expose individuals to the organization's practice and business processes through experience. Yet, the project-based organization, in reducing the significance of the functional hierarchy, loses its ability to act as a repository of experiential knowledge, and to provide experiential learning to individuals (Keegan & Turner, 2000; Pinto, 1999; Gibson & Pfauz, 1999). The temporary formations characteristic of projects do not foster retentive attributes such as routines and long term relationships which are critical to holding and transferring lessons learned from prior project experiences.

1.2 Problem Statement

The potential to learn from project experiences is tempered by limited prospects for the diffusion of such knowledge to other projects and across the wider organization (Ayas & Zeniuk, 2001). Researchers have found that too many project-based organizations are not learning adequately from their mistakes to exploit knowledge fully (e.g., Newell et al., 2006; Keegan & Turner, 2001). Many of these organizations do not have a systematic approach for capturing prior learning, they do not expose apprentices to lessons learned, and hardly encourage practitioners to reflect on their own experiential learning (Pinto, 1999) such that there is little, if any learning within projects. Scarbrough et al (2004) note that even where significant knowledge is generated within projects, there are often difficulties in capturing or translating this knowledge into new routines and practices at the level of the organization. The inability to transfer lessons learned from one project to another often results in re-inventing the wheel, repeating mistakes, and less than optimal performance (e.g., Newell et al., 2006; Disterer, 2000; Schindler & Eppler, 2003; Prusak, 1999).

Previous research has shown that learning practices such as project reviews and document maintenance have not been widely adopted in practice and where they are used, implementation methods vary greatly limiting the usefulness of any results (e.g., Williams, 2007, 2008; Von Zedtwitz, 2002; Wasiyo, 2007). Other studies have found that sharing knowledge across organizational units is challenging, often riddled with significant social, cognitive, organizational, technological, methodological, and cultural barriers (e.g., Reige, 2005; Bhurid et

al., 2005; Barnard, 2005; Ajmal & Koskinen, 2008; Wang & Noe, 2010; Cabrera & Cabrera, 2002; Schilling & Kluge, 2008). It is therefore important to investigate how project-based organizations can overcome these challenges to fully leverage the lessons learned from their experiences. The challenges to using lessons learned have yet to be fully addressed (e.g., Besner & Hobbs, 2006; Newell, 2004; von Zedwitz, 2002; Williams, 2004). Moreover, we have yet to discern how to systematically extract and disseminate management lessons as we move from project to project (Cooper et al., 2002, p. 213). This study addresses an under researched gap in the literature on knowledge management and organizational learning and should form the basis for more research to further our understanding of project-based learning.

1.3 Objectives and Research Questions

The purpose of this study was to develop a broad overview of project-based learning from the perspectives of project team members from two small organizations in Uganda. The study examined how these project-based organizations learn. Specifically, I studied how project team members were able to capitalize on knowledge acquired during the execution of projects, and how they captured and transferred this knowledge to subsequent projects or to other parts of the organization to generate value. To achieve these objectives, the following research questions were addressed:

1. What are the practices used to acquire, retain, and transfer knowledge across projects and the wider organization?
2. What are the barriers to learning across projects and how do they influence the learning practices?
3. How do organizations differ with respect to learning?

1.4 Overview of Methodology

This study used a qualitative, multiple-case study design. The unit of analysis study was learning practices – empirical instances, such as lessons learned sessions or meetings. Data was collected from 25 semi-structured interviews of project team members and supplemented by reviewing selected project documents. The case study approach was appropriate for this study which examined multiple perspectives to develop an understanding of project-based learning as experienced by participants in two small organizations in Uganda. The cross-sectional study used

snapshot data collected at a single point in time. Interview sessions were recorded and transcribed for analysis. Interview transcripts were analyzed using data reduction techniques for identifying patterns and categories, and finding relationships among them (Miles & Huberman, 1994; Patton, 1990).

1.5 Significance of the Study

The findings of this study are likely to advance knowledge in project-based learning considering that learning plays an important role in driving competitive advantage. Researchers in project management have identified lessons learned and project reviews as best practices for leveraging project capabilities. However, these same practices have not been widely adopted by practitioners to promote learning across projects. In cases where these practices are used, their success has been minimal. This study identifies five types of barriers (personal, organizational, technological, knowledge type, and project characteristics) that inhibit learning across projects and offers possible solutions to overcome these barriers and promote project-based learning.

In addition, organizational learning research suggests that both exploration and exploitation are essential for organizations to learn. Exploration involves discovery of new knowledge while exploitation involves reuse and refinement of existing knowledge. Organizations that engage in exploration to the exclusion of exploitation are likely to find that they suffer the costs of experimentation without gaining many of its benefits. They exhibit too many undeveloped new ideas and too little distinctive competence. Conversely, organizations that engage in exploitation to the exclusion of exploration are likely to find themselves trapped in suboptimal stable equilibria. As a result, maintaining an appropriate balance between exploration and exploitation is a primary factor in organizational survival and prosperity. However, without memory, exploitation is almost impossible. Memory provides persistence of knowledge or skills acquired such that they are available for future use. This study emphasizes the importance of organizational memory stores such as people, organizational processes, routines, and knowledge repositories and provides insight for further research into the role of organizational memory in project-based learning.

As well, this study makes methodological contributions by using a multi-level unit of analysis; learning practices. This allowed for identification of empirical instances at the individual, group, and organizational levels. Rather than focus on either the dynamics of

individual learning, or project team interactions, or organizational systems alone, this study captured learning practices across all levels, thereby emphasizing the learning processes. The versatility in analysis permitted by such a unit of analysis seems likely to benefit future research.

In addition, the results of this study would seem to be of importance to practitioners in identifying the most significant learning barriers in a given organization, considering its unique local context. Solutions to the barriers would then be developed, integrating pre-existing learning practices. The learning solutions would contribute to closing the gap between the potential to generate knowledge in project settings and the lack of diffusion of that same knowledge across projects.

1.6 Definitions

This section presents a list of key terms used in the dissertation along with their definitions.

Knowledge. Knowledge (is) an individual's perception, skills and experience, which are all dependent on what experiences the individual's worldview contains in the form of meanings (Koskinen & Philanto, 2008). In the context of project-based organizations,

> Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. (Davenport & Prusak, 1998, p. 5)

Knowledge serves as a background for articulating possible courses of action, for judging whether courses of action will yield the intended results and for using this judgement to select among courses of action, for deciding how actions should be implemented, and for actually implementing actions. Therefore knowledge generate appropriate actions through articulation, selection and implementation (Achterbergh & Vriens, 2002). There are two forms of knowledge: tacit and explicit.

Explicit knowledge. Explicit knowledge can be formalized and codified, and is sometimes referred to as know-what (Brown & Duguid, 1998). Explicit knowledge is easily documented and communicated, and can usually be transferred using the basic communication model, i.e. a sender with an idea, concept, or question encodes the message and sends it to the intended receiver, who decodes and acts upon the message.

Tacit knowledge. Tacit knowledge refers to unarticulated insights rooted in experience and intuition and tied to the senses; it "indwells" in a comprehensive cognizance of the human mind and body (Nonaka & vonKrogh, 2009). Tacit knowledge is difficult to transfer (but not impossible). Before tacit knowledge can be communicated, it must be converted into words, models, or numbers that can be understood.

Knowledge management. Knowledge management is the deliberate and systematic coordination of an organization's people, technology, processes and organizational structure in order to add value through re-use and innovation. This coordination is achieved through creating, sharing and applying knowledge as well as through feeding the valuable lessons learned and best practices into corporate memory in order to foster continued organizational learning (Dalkir, 2005).

Learning. Learning is knowledge or skill acquired through study, experience or teaching; it is "the process by which knowledge is created from experience and the path by which improvement takes place" (Fiol & Lyles, 1985, p. 811). Learning is manifested by change in action or behavior following the acquisition of new, previously unknown knowledge, it encompasses both the acquisition of *know-how*, which implies the physical ability to produce some action, and the acquisition of *know-why*, which implies the ability to articulate a conceptual understanding of an experience (Kim, 1993).

Organizational learning. Organizational learning is an organizationally regulated collective learning process in which individual and group-based learning experiences concerning the improvement of organizational performance and/or goals are transferred into organizational routines, processes and structures, which in turn affect the future learning activities of the organization's members (Schilling & Kluge, 2008, p.338)

Program. Programs are a set of related projects, for example Archibald (1992) defines a program as "a long term undertaking which is usually made up of more than one project" (p. 24).

Programs are more than the categorization of similar projects, or even the assignment of similar projects to a common management team. Instead, programs are integrally related projects, which together move toward the realization of a particular organizational goal. The

better designed and managed the program, the more efficiently the goal is realized (Olson & Branch, 2002).

Project-based organization. Project-based organizations are "organizations whose operations consist primarily of projects" (PMI, 2004, p. 27). Project-based organizations refer to a variety of organization forms that involve the creation of temporary systems for the performance of project tasks (Lundin & Söderholm, 1995; DeFillippi, 2002). Project-based organizations range from the pure functional through the matrix form to the pure project-based form (Galbraith, 1969). In the functional form, organizational activities are organized according to functional specialization e.g., in marketing and research and development (R&D) firms. In the matrix form these activities are organized both within projects and along functional lines e.g., in technology firms (Brady & Davies, 2004). Within the pure project-based organizations, projects "embody most, if not all, of the business functions normally carried out within departments of functional or matrix organizations" and act as the main mechanisms for coordinating and integrating them (Hobday, 2000, p. 874) e.g., in construction firms (Gann & Salter, 1998).

***Project team*:** Individuals drawn from across different roles within the same organization to collectively undertake a specific project. Participation in the collective effort makes them members of the group or project team.

1.7 Delimitations

This study examined the practices used to acquire, retain and transfer knowledge from completed projects by project team members at two small organizations in Uganda, one a development aid non-profit organization and the other, a for-profit telecommunications contractor. Results specific to these organizations provide a basis from which to further investigate approaches to project-based learning by industry, and to explore national inclinations. The study was cross-sectional, using snapshot data collected at a single point in time to inquire into project-to-project learning at the individual, project team and organizational levels. In this study, the project provides a specific context in which to explore organizational learning given the particular characteristics of temporariness, unique tasks, defined objectives, and limited time frame. The project-based organization's approach to learning across projects was necessarily

customized to how important critical project knowledge is acquired, shared and retained to improve outcomes in subsequent projects.

1.8 Structure of the Dissertation

This dissertation consists of six chapters, including this introductory chapter. Chapter One contains the introduction and problem statement for the study. Chapter Two presents the literature review and Chapter three the conceptual framework. Chapter Four details the research methodology used in the study. Chapter Five introduces the findings of the study. Chapter Six analyses and discusses the findings, drawing links to relevant literature. The chapter also presents contributions to research and implications for theory and practice.

CHAPTER 2: LITERATURE REVIEW

This chapter presents a review of the literature on project-based learning. The review examines theoretical and empirical studies in the field. Section 2.1 presents a conceptualization of project-based learning from an organizational learning perspective, distinguishing between inter-project learning and intra-project learning. Sections 2.2 and 2.3 review approaches to and benefits of project-based learning respectively. Sections 2.4 and 2.5 review some of the project-based learning practices used in contemporary organizations and their prevalence in practice. Section 2.6 examines barriers to project based learning in five categories pertaining to personal, organizational, and technological barriers, knowledge type, and project characteristics.

2.1 Project-Based Learning

Project-based learning as conceived in this study is different from the teaching approach addressed by learning sciences researchers, in which students explore real world problems and challenges to acquire deeper knowledge by working with and using ideas (Krajcik & Blumenfeld, 2006). As a form of organizational learning (collective process of information acquisition, retention and dissemination), project-based learning generally refers to the acquisition of knowledge within project ventures, its codification, and transfer to other projects and across the organization (Prencipe & Tell, 2001; Scarbrough et al., 2004). It is concerned with the deliberate and systematic reflection on project experiences to generate lessons and using the lessons to improve outcomes in subsequent projects (Ayas & Zenuik, 2001; Prencipe & Tell, 2001). Project-based learning consists of harvesting knowledge and lessons learned from one project for application in another project (Schindler & Eppler, 2003). This learning process through projects is one of the main ways in which organizations interact with and are changed by their environment (Brady & Davies, 2004).

Project-based learning takes place either within the same project (intra-project) or between one project and another or the wider organization (inter-project). This study is interested in inter-project learning. Inter-project learning involves sharing and combining information and lessons learned across projects to apply and develop new knowledge (Kotnour, 1999). Inter-project learning takes place by transferring the experience acquired from different projects over a period of time; it is the accumulation of knowledge and its transfer to subsequent projects. Inter-

project learning aims at delivering a series of successful projects by continuously building an organization's capability to execute projects. Additionally, inter-project learning can be temporal (i.e. learning from the experience of past projects) as well as concurrent (i.e. learning from ongoing projects).

On the other hand intra-project learning refers to a learning process in which the acquisition, transfer, and use of experience occur within the same project (Antoni, 2000). Intra-project learning focuses on tasks within a single project and emphasizes improving project performance by identifying problems and solving them during a project's life span. Antoni (2000) further argues that intra-project learning is able to align and develop the capacity of a team to create the results its members truly desire. Through this process, the uncertainty involved in a project can be reduced by creating and sharing the experience accumulated during the project life cycle. Learning occurs when project team members discuss strategies and approaches for completing tasks or solving problems. The goal is to deliver successful projects by identifying problems and solving them during the project's lifetime.

Inter-project learning and intra-project learning are interdependent. The success of an individual project often depends on how well the lessons learned from other projects are transferred and applied to it, and how feedback is generated, synthesized and shared with subsequent projects at the end of the project (Fong, 2003). The goal is to disseminate knowledge across the organization. Whereas the present study is interested in inter-project learning, learning within projects supports learning between projects by providing a routine, ongoing store of data, information, and knowledge which is integrated into a living lessons learned for the organization.

2.2 Approaches to Project-Based Learning

Available approaches to learning across projects may be broadly characterized in terms of a continuum ranging from cognitive learning models (based on acquisition and retention of knowledge) to community or social learning models (based on explanations of individual experience) (Swan et al., 1999).

The cognitive learning model is based on a tools-based, information processing view of the firm. This view is concerned with the identification, capture and processing of valuable knowledge located inside people's heads via the use of technology so that it can be transferred to new contexts. The aim is to make knowledge held by people (cognitive knowledge) widely

available in order to reduce the threat of valuable knowledge assets literally "walking out of the door" (Swan et al., 1999, p. 265). The cognitive approach, which is perhaps the most pervasive learning strategy in organizations, is driven in large part by the increasing availability of information-based tools such as groupware and intranets (Sanchez & Heene, 1997), and the subsequent ease in manipulating and distributing codified knowledge. This model stresses the codification of knowledge and is primarily concerned with its retention and circulation within the organization via the application of information and communication technologies (Cole-Gomolski, 1997).

The community learning model is based on the understanding that experiences, insights and reasons why are difficult to capture and transfer from one context to another but that they can be explained through social interaction. The community learning model emphasizes the importance of social networks and the cultivation of trust, norms and shared values amongst members (Brown & Duguid, 1991; 2001). Learning is facilitated by conversation, discussion and negotiation, and the diffusion of knowledge involves developing some level of shared meaning that allows one group to understand and apply another's insights to their own context (Senge, 1990; Weick, 1995). The community learning model focuses on the processes of articulating knowledge and negotiating meaning rather than capturing cognitive knowledge. Unlike information, knowledge cannot simply be processed; rather it must be continuously re-created and re-constituted through dynamic, interactive and social networking activity (Swan et al., 1999).

2.3 Benefits of Project-Based Learning

The ability of organizations to learn is increasingly recognized as an important, and in some accounts a unique source of sustainable competitive advantage (Levinthal & March, 1993). This is reflected both in the attention given to learning and learning organizations in management circles (e.g., Senge, 1990; Stalk, Evans & Shulman, 1992), in the exploration of learning models of adaptation by economists (e.g., Cross, 1983) and in studies of organizations (e.g., Argyris & Schon, 1978; Levitt & March, 1988). The extant organizational learning literature has placed continuous learning and knowledge accumulation at the very center of organizational-level competitiveness citing several benefits to organizations that invest in learning, including improved work performance (Arthur & Huntley, 2005), increased efficiency in problem solving

(Kamara et al., 2002), higher innovativeness (Lichtenthaler, 2009), increased market share (Lin & Kuo, 2007; van Wijk et al., 2008), improved organizational capabilities (Brady & Davies, 2004), and higher productivity (Fuentelsaz et al., 2009). Systematic project-based learning enables an organization to develop project competencies that lead to a sustainable competitive advantage. For example, the analysis gathered in the learning process enables companies to document their most effective problem-solving practices such that they can be accessed in future projects. In addition, the systematic documentation of mishaps or mistakes helps to reduce project risks (Schindler & Eppler, 2003).

Furthermore, Hanisch et al (2009) summarized the benefits of project knowledge management as: increasing work efficiency and reducing risk by capitalizing past project experiences, and applying the knowledge acquired to build a continuous learning process across a series of projects and throughout the organization. In this way, the lessons learned on one project can have benefits beyond that project's boarders. Project knowledge management also allows organizations to: 1) continuously revise and develop new processes and products. This includes preventing mistakes, which may be part of the experience of previous projects. 2) Appropriate staff projects. This goes beyond the optimal allocation of available resources and applies to staffing of projects based on competences and expert knowledge of the project team members. 3) Identify and foster innovation, especially through leveraging the advantages of interdisciplinary project teams. Therefore, the management of knowledge within and across projects has increasingly become an important, even decisive competitive factor (Hanisch et al., 2009).

2.4 Learning Practices

Project-based organizations use various methods, tools, and techniques to acquire, retain, and transfer knowledge across projects and to different parts of the organization, such as organizational routines, project reports, personnel rotation programs, education and training, team meetings, and project databases. Best practices typically involve conducting project reviews to elicit lessons learned at the end of a project or project phase (e.g., Koners & Goffin, 2007; Busby, 1999; von Zedtwitz, 2002, Anbari et al., 2008; Raelin, 2000), and maintaining project documentation (e.g., Newell et al., 2006; Prusak, 1997; Scarbrough et al., 2004). The extant project management literature indicates that project closing is becoming the most important phase to capture new knowledge and prepare it for transfer to other projects.

Increasingly, the use of terms such as *experience retention, divestment,* and *debriefing* at the end of a project represents an opportunity to identify and secure the knowledge and experiences of project team members for transfer to other projects (Disterer, 2002). This section reviews some of the learning practices recorded in the literature.

Anbari et al. (2008) define a post-project review or evaluation as "a systematic inquiry concerning the merit of management and technical processes, and performance criteria. It helps identify root causes of success or failure and highlights improvement opportunities" (p. 635). Post-project reviews provide an important opportunity to link the effectiveness in meeting project goals, efficiency in utilizing the resources assigned to the project, and transfer of the special knowledge gained in performing one project to other projects, which is essential to the overall performance and improvement of current and future projects (Huemann & Anbari, 2007). Project reviews reflect on past performance and in so doing generate insights on what worked and what did not work. Learning occurs when the insights are applied to improve performance. Once the knowledge has been captured, the reviews are entered into databases, alongside other project documentation. The idea is that other project teams can then search these documents either by project title, author or keywords, assimilate the knowledge they contain, and so learn from them. In this way, it is assumed, knowledge and learning can be shared across projects and reinvention can be avoided (Sharp, 2003). The term (post project reviews) is also used interchangeable with its variants such as: debriefing (Schindler & Eppler, 2003), Post Project Appraisal - PPA (Gulliver, 1987), After Action Review – AAR (Cross & Baid, 2000), Project Post Mortem - PPM (Williams et al., 2001), Post implementation evaluation (Kartam, 1996), project audit, project close out and post completion review.

Project reviews have been widely promoted as mechanisms to elicit and retain what has been learned on a project so that it can be leveraged by others (Raelin, 2000). The main objective of project reviews is to initiate and facilitate continuous learning on all levels within an organization (von Zedtwitz, 2002). Learning from project reviews is not limited to the lifetime of a single project. While a final project review closes out the current project, it may also create the grounds for a new project, based on insights gained from the lessons learned. Project reviews introduce a systematic way to higher order learning by making project specific knowledge and experience available to a corporate-wide pool of organizational and technical knowledge.

> "A lesson learned is knowledge or understanding gained by experience. The experience may be positive, as in a successful test or mission, or negative, as in a mishap or failure. The lesson must be significant in that it has a real or assumed impact on operations, valid in that it is factually and technically correct, and applicable in that it identifies a specific design, process or decision that reduces or eliminates the potential for failures and mishaps, or reinforces a positive result" (Secchi et al., 1999, p. 1).

Lessons learned practices contribute to quality improvement (Schindler & Eppler, 2003; Kotnour, 1999; Kamara et al., 2002; Koners & Goffin, 2007), delivery of more successful projects, and improving customer satisfaction (Kotnour, 1999), identification of successful and unsuccessful practices (Busby, 1999), disseminating and sharing information (Busby, 1999), and externalizing tacit knowledge (Disterer, 2002).

The lessons learned from reviewing projects provide a consolidated body of data and information that can serve as baseline historical information for future projects. This database enables future project managers and their team members to make more accurate estimates of cost, schedule, and technical performance (Anbari et al., 2008). Similarly, the lessons learned from earlier projects enable project managers to identify the range of customer expectations, determine the probability of scope creep with certain types of projects and specific project customers, establish the range of acceptable quality standards for project deliverables, identify and quantify the impact of risks that can disrupt and even ensure failure of a project, map the responses to project risks and uncertainties at each phase of the project life cycle, and identify potential *invisible potential customers* to the project (Anbari et al., 2008). The value of post project reviews therefore is derived from the effective flow of information concerning lessons learned in various projects to enhance performance of current and future projects.

Another learning practice involves transferring knowledge across projects by moving the knowledge holders (project team members) from one project to another. Re-assignment of experienced staff or experts to other projects can create the opportunity for the transfer of more tacit knowledge through people to people interactions among project staff (Tan, 2010). This method is based on the assumption that the knowledge acquired from one project can be transferred by reassigning people involved to another project (Kamara et al., 2003). When project team members are moved from one organizational unit to another, they are able to transfer tacit as well as explicit knowledge (Berry & Broadbent, 1984; 1987), and subtle

understandings to the new unit. Further, project team members are capable of adapting knowledge to the new context (Allen, 1977). Although social psychological processes affect people's willingness to both share knowledge and be influenced by knowledge (e.g., Gruenfeld et al., 2000), people are generally very effective knowledge conduits.

Project lessons may also be transferred through documents and reports. Project documents include physical artifacts representing the symbolic meaning of knowledge in organizations. They exist in the form of data, charts, operation manuals, instruction guidelines, formulas, and any written reports that contain detailed and yet well-codified responses for various contingencies. According to Keegan and Turner (2001), the majority of project-based organizations work to project procedures developed by them or by their clients. These procedures contain instructions on how projects are to be completed, including safety standards, communication protocols, relationships with sub-contractors, engineering specifications and many other issues. The expectation is that projects proceed along these company/client guidelines, laid down in documented form in process manuals. If for any reason a project deviates from company procedures, the reason for deviation should, in an ideal scenario, be fed back to the process owner. This person decides if the deviation is really a source of learning, if it is worth capturing that learning, and altering the procedures or processes by which the company works. For example, if there is an innovation in piping during construction of a building, then the project team member (piping engineer) should report this innovation (deviation) to the head of engineering (process owner), who should ideally decide if it represents real learning (verify), record (capture) this information, share it with others and adopt it future piping work (alter processes or procedures). This system of retention is dependent on project team members reporting the deviation and the process owner examining the deviation and writing it up for explanation and dissemination to others. Learning by documenting operates upon the premise that codification of these procedures enables easy transfer and replication in different situations.

Another learning practice is the use of centers of excellence. Centers of excellence serve to retain learning developed within the organization (Keegan & Turner, 2001). For example, in an international company, the centers of excellence offer advice to subsidiaries in specific project processes (e.g., bid management), and record changes in the company's ways of doing things. Where deviations in local practice are examined and determined to be successful, the role of the center of excellence is to codify these deviations, provide training, and retain the learning within

the company for all relevant members. In a company without subsidiaries, the project management office can serve as a center of excellence. A project management office is a formal layer of control between top management and project management within a project-based organization (Kerzner, 2003; Liu & Yetton, 2007), which institutionalizes governance strategies (Muller, 2009). In the role of a center of excellence, the project management office records best practices and lessons learned from different projects across the organization; these can then be used for training and retention of learning within the company.

Communities of practice are well known for their knowledge creation, sharing and learning benefits. Communities of practice (CoP) are groups of people who share a concern or passion for something they do and learn how to do it better as they interact regularly. This learning is not necessarily intentional (Lave & Wenger, 1991). However, knowledge sharing communities need some formality, defined learning goals, organizational support and coordination to maintain social networks and contacts. There are three required components of CoPs: a domain, a community, and a practice. First, a CoP has an identity defined by a shared domain of interest; it's not just a network of people or club of friends. Membership implies a commitment to the domain. Second, members of a specific domain interact and engage in shared activities, help each other, and share information with each other. They build relationships that enable them to learn from each other. Third, a CoP is not just people who have an interest in something (e.g., sports or gardening). The members have to be practitioners. They develop a shared repertoire of resources which can include stories, helpful tools, experiences, or ways of handling typical problems. This kind of interaction needs to be developed over time. CoPs develop their practice through a variety of methods, including problem solving, requests for information, seeking the experiences of others, reusing assets, coordination and synergy, discussing developments, visiting other members, mapping knowledge, and identifying gaps.

Social contacts provide another social learning practice. Having the opportunity to interact with other co-workers is an essential channel to get to know different perspectives, share one's knowledge and ignorance, and pool expertise in order to find solutions to common problems. Ruuska and Vartianen (2005) examined the role of communities, as informal and semi-formal social structures formed around shared interests, and as personalized knowledge sharing mechanisms in project-based organizations. They found that such social structures enhance knowledge sharing within projects and help to connect peers working on dispersed

projects. Maurer et al. (2011) suggest that social ties between organization members present opportunities for knowledge transfer, and serve as channels for information exchange and knowledge flows. A greater number of direct channels between organization members not only grants potential access to organizational knowledge resources, but also increases the ease and extent of knowledge transfer (Koka & Prescott, 2002; McFayden & Cannella Jr., 2004). Similarly, Lindqvist et al., (2007) found that the transfer of knowledge relied on connecting people in networks. As well, Bresnen et al. (2003) found that the networks and social contacts of individual engineers were important means of accessing and circulating knowledge regarding technical developments, and thus were potentially important ways of enhancing the firm's ability to recognize the value of lessons learned, assimilate them, and apply them to realize the organization's goals.

Social networks have been shown to have several effects on knowledge transfer within organizations. For example, early research on social networks compared the effects of various communication channels (e.g., a *wheel* in which all communication went through a central hub versus an *all-channel* network in which all members could communicate with one another) on information sharing and performance in groups. Although the wheel network was initially shown to be the best communication structure (Guetzkow & Simon, 1955; Levitt, 1951), this effect was subsequently shown to depend on the uncertainty of the task. For routine tasks, centralized structures such as the wheel were associated with the greatest performance, whereas for non-routine or uncertain tasks, decentralized structures such as the all-channel network, were associated with the highest performance (Heise & Miller, 1951; Macy, Christie, & Luce, 1953; Shaw, 1954, 1964). In addition, Hansen (1999) found *that weak ties* between network members facilitated the search for new knowledge in other units when knowledge could be codified. He also found that *strong ties* between network members facilitated the acquisition and interpretation of knowledge that could not be codified. The repeated interactions inherent in strong ties are critical for understanding and interpreting non-codified, tacit knowledge. Other studies of social networks have focused on dimensions of networks in addition to the extent of their decentralization. Having positions that bridge structural holes (Burt, 1992) has been found to be an effective mechanism for importing knowledge from other organizational units (McEvily & Zaheer, 1999). Allen (1977) found that having a *gatekeeper* at the boundary of a group who

could communicate with internal and external constituencies improved the performance of applied research groups because these gatekeepers facilitated knowledge transfer.

Project knowledge is also shared externally through relationships with different stakeholders. Stakeholders include customers or clients, beneficiaries, suppliers, and every party that stands to gain or has invested in a given project or program. Maintaining cordial relationships with all parties is important for the smooth execution of the organization's activities. Organizations generally provide information to their stakeholders at the end of the year in the form of annual reports, however, communication between the two can be more frequent depending on an organization's needs. Stakeholders in turn communicate with organizations, usually in the form of providing feedback on services or products. Customer feedback may consists of negative or positive opinions expressing satisfaction or dissatisfaction with the products and/or services received. Feedback may also be obtained formally through solicited customer satisfaction forms, user surveys, use/non-use data or client testimonials. However, feedback may also be informal such as in face-to-face conversations, passing comments about a product or unsolicited likes and comments on social media.

Organizational learning involves creating knowledge from experience. In this sense learning is dependent on integrating and interpreting new insights with memory thus; the basic processes that contribute to the occurrence, breadth, and depth of organizational learning depend on organizational memory. Organizational memory, also called institutional or corporate memory- is the accumulated body of data, information, and knowledge created in the course of an individual organization's existence (OED.com, 2011); it is organizational knowledge with persistence (Ackerman, 1998).

Organizational memory is intrinsically linked with organizational learning as a record of experience (e.g., Bannon et al., 1996; Cohen & Sproull 1996). Organizational memory can only be applied if it can be accessed. To make use of it, organizations must have effective retrieval systems for their archives and good memory recall among the individuals that make up the organization. Walsh and Ungson (1991) undertook an extensive examination of the organizational memory literature and found several propositions; some suggested that organizational memory comprises standard operating procedures (March & Simon, 1958) or routines (Nelson & Winter, 1982, p. 99). Others paid more attention to the organization's culture (Barney, 1986; Pfeffer, 1981) as the repository of its knowledge. Yet, others looked to the

organization's artifacts, physical architecture, stories, heroes, and internal information repositories such as corporate manuals, databases, filing systems and formal and informal structures as types of organizational memory (Morgan & Root, 1979; Orr, 1986; Yates, 1989). The different perspective suggest that organizational memory has six storage bins or repositories; individuals, culture, transformations, structure, ecology and external archives (Walsh & Ungson, 1991, p. 64).

Knowledge bases are repositories that store knowledge about a topic in a concise and organized manner (Ruikar et al., 2003) for fast retrieval and reuse. The information stored has usually been validated and is available to all employees. It is typically reusable, in forms such as frequently asked questions, how-to guides, simple forms, templates, lessons learned and best practices. In the case of best practices, the details captured may include where the idea originated, a brief description of the practice, the savings it achieved and the name of a contact person from whom more information can be obtained (Dixon, 2000). These knowledge bases are often technology enabled and use search engines to find and retrieve information when needed. Some knowledge bases however, may be paper-based, with project information stored in binders and file cabinets. Information in the knowledge base may be gathered voluntarily by encouraging project team members to submit lessons learned from a project using simple templates and worksheets. This information may also be sourced from formal sessions specifically conducted for the purpose of eliciting and capturing lessons learned.

To learn from the experience of previously completed projects, knowledge may be acquired from direct participation of project team members who were part of the original projects. However, for other members of the organization, the experience has to be articulated and shared. Other project teams learn by reviewing the actions taken on previous projects, identifying successes which they may try to re-create, and acknowledging lessons learned which they avoid. In turn, the current teams retain and pass on their knowledge to future teams by capturing and preserving their experiences and insights.

2.5 Prevalence of Learning Practices

The literature on the prevalence of learning practices is somewhat divided. Some studies state as an accepted fact that learning is rare. For example, Gulliver (1987) found that "few companies examine their completed projects in any depth" (p. 128). Additionally, from her study

of learning in the UK retail banking industry, Harris (2002) concluded that learning from past mistakes, or even building upon past successes, continues to be the exception rather than the rule. Similarly, Disterer (2002) revealed that only a few firms manage systematically to identify and transfer valuable knowledge from completed projects to following projects. Project teams frequently disband upon project completion without conducting post project reviews and disseminating the lessons learned (Carillo, 2004). Other studies argue that lessons learned activities and learning from projects generally occur in practice or are even *ubiquitous* (Newell, 2004). As firms increasingly become more innovative and project-based, many are recognizing the need to capture the learning from individual projects, and make this learning available throughout the organization (Scarbrough et a.l, 1999).

Despite the generally accepted usefulness of lessons learned, few organizations actually do lessons learned in practice and, where they exist, their effectiveness is questioned as organizations do not seem to learn from past mistakes (Koners & Goffin, 2007; Prencipe & Tell, 2001). In a 2001 survey of NASA's lessons learned process, Maya (2005) found that there is no assurance that lessons learned are being applied, there is unfamiliarity with lessons learned across programs; cultural barriers inhibit sharing, capturing, and submitting lessons; there is an apparent lack of support from agency leaders; success in industry comes from commitment to knowledge sharing. Although these key findings reflect lessons learned at NASA in 2001, they would probably apply to many large organizations today.

Besner and Hobbs (2004) found that *lessons learned* was one of the most frequently used project management tools, with the use of a lessons-learned database differing significantly between low and high project-management maturity organizations. It seems logical that most project based organizations would adopt lessons learned practices as part of improving their project management capability; however previous studies have found the opposite. VonZedtwitz (2002) found that 80% of all R&D projects were not reviewed at all after completion, and most of the remaining 20% were reviewed without established review guidelines. Learning from post project audits was seen as one of the 10 practices which confer R&D advantage but came in bottom place in frequency of occurrence (Menke, 1997). In new product development, Lilly and porter (2003) found that improvement reviews were a low priority. Most of the firms they interviewed conducted reviews only on selected projects.

Weber's (2000) study found that existing, deployed lesson learned systems do not support all lessons learned processes. Organizations typically do not develop software to support verification or reuse stages. Instead, they use electronic submission forms to facilitate lesson collection, and use a standalone tool to support lesson dissemination (Weber et al., 2000a). Users interacting with this standalone tool are expected to browse the stored lessons, studying some that can assist them with their decision-making process (es). However, based on interviews and discussions with members of several organizations (e.g., at the Joint War fighting Center) Weber et al (2001) concluded that available standalone LL systems were not fully utilized as they did not provide for the knowledge dissemination method to be embedded in the process they were intended to support which caused fragmentation in the flow of knowledge (e.g., Reimer, 1998; Aha et al. 1999; Leake et al., 2000).

Perhaps the most ambitious investigation of lessons learned processes was performed by the Construction Industry Institute's (CII's) Modeling Lessons Learned Research Team (Fisher et al., 1998). They surveyed 2,400 organizations, characterized the 145 initial responses as describing 50 distinct LL processes, and performed follow-up, detailed investigations with 25 organizations. Fisher et al (1998) found strong evidence that most organizations were using insufficient dissemination processes. Therefore, in as much as lessons were collected, verified and stored, they were not effectively distributed, limiting their application and intended benefits. One year later, Secchi et al. (1999) found that only 4 of the 40 organizations who responded to their survey used software to support their LL process. In both surveys, none of the responding organizations implemented an active LL process for lesson dissemination, probably because software was not used to control the process (es) targeted by the lessons, or elicited lessons were immediately/ manually incorporated into the targeted process (e.g., into the organization's best practice manuals, or by requiring project members to read through project-relevant lessons prior to initiating a new project).

A benchmarking study of 79 highly regarded R&D organizations conducted by Menke (1997) showed that less than a quarter of the 79 organizations made full use of post-project reviews. Similarly, in an exploratory survey on lessons learned processes in R&D organizations, von Zedtwitz (2002) conducted 27 in-depth interviews with R&D managers at Hewlett-Pakard, DaimelerChrysler, SAP, Unisys and the US Army. He found that although most R&D organizations seem to understand the potential benefit of post-project review, they still did not

make full use of this learning opportunity. Although post-project reviews were conducted in almost every company and within most departments represented, they were mostly conducted on an ad-hoc basis or after particularly large projects. Only 3.6% respondents indicated an attempt to review as many projects as possible and 55.6% of respondents stated that their companies had not established formal guidelines on how to conduct post project reviews. He concluded that many companies give away great potential for competence building by neglecting post-project reviews as a tool for systematic inter-project learning. In another survey by Ernst and Young of 30 project management professionals, although 90% of the respondents believed lessons learned reviews on projects were important, only 13% said their organizations performed them on all projects and only 8% believed the primary objective of the reviews was to understand the benefits that would accrue to the organization (Ernst & Young, 2006).

2.6 Barriers to Project-Based Learning

This section discusses barriers encountered in transferring lessons learned from completed projects to other projects and across the wider organization. Schilling and Kludge (2008) conducted a systematic review of the literature on factors that might hinder organizational learning. The authors categorized barriers to organizational learning based on the *form* of the barriers, which could either be action-personal, structural organizational or societal-environmental. According to Schilling and Kludge, action-personal barriers were characterized by individual thinking, attitudes and behavior, structural-organizational barriers were rooted in organizational strategy, technology, culture and formal regulations, and societal-environmental barriers included impediments associated with those parts of the social and material world that members perceived as relevant for organizational action such as, customers (distributors or actual users of products or goods), suppliers (new materials, equipment, product parts, labour), competitors (for suppliers, for customers), sociopolitical environment (government regulatory control over industry, public political attitude towards industry and its particular products, relationship with trade unions), and technology (meeting new technological requirements in their own industry and related industries in production of a product or service, improving and developing new products by implementing new technological advances in the industry).

Another classification of knowledge sharing and learning barriers was proposed by Reige (2005); individual, organizational and technological barriers. Individual barriers to knowledge

sharing are often related to factors such as lacking communication skills and social networks, differences in national culture, overemphasis of position statuses, and a lack of time and trust. Organizational barriers to knowledge sharing tend to be linked to, for instance, the economic viability, lack of infrastructure and resources, the accessibility of formal and informal meeting spaces, and the physical environment. Technological barriers seem to correlate with factors such as the unwillingness to use applications due to a mismatch with need requirements, unrealistic expectations of information systems and technologies, and difficulties in building, integrating and modifying technology-based systems. Generally, there are various reasons why people hoard their knowledge and the contexts are often multidimensional.

In his study of organizational knowledge transfer, Szulanski (1996) noted that organizations must increasingly transfer internal capabilities to remain competitive. However, organizational knowledge was sticky (cost of knowledge transfer) making the transfer of internal capabilities very difficult (p.23). Szulanksi attributed the difficulty of internal knowledge transfer to four factors: characteristics of knowledge transferred, characteristics of the knowledge source, characteristics of the knowledge recipient, and characteristics of the context in which the transfer takes place. In keeping with previous categorizations, learning barriers may result from the knowledge source, recipient, knowledge itself, or context of transfer.

Furthermore, the very project characteristics (e.g., temporary nature, unique tasks, immediacy of project objectives, and high mobility of project teams) that facilitate knowledge generation may pause considerable barriers to project based learning (Love et al., 2005).

Taken together, the barriers to project-based learning may be grouped in five categories: personal, organizational, technological, knowledge type, and project characteristics.

2.6.1 People-Centered Barriers

An organization's ability to effectively leverage its knowledge is highly dependent on its people, who actually create, share, and use the knowledge. Leveraging knowledge is only possible when people can share the knowledge they have and build on the knowledge of others (Ipe, 2003). Many organizations consider people (employees) as their most important assets and recognize that factors which affect employees in turn affect their work and ultimately the organization's performance. Employee motivation has been identified as one of the biggest barriers to successful knowledge transfer initiatives (Dyer & Nobeoka, 2000; Osterloh & Frey,

2000; Ruggles, 1998; Szulanski, 2000). Extant research has suggested several factors that influence employee motivation to share, including extrinsic rewards (Huber, 1991; Kogut & Zander, 1992; Pan & Scarbrough, 1998), inequalities in power and status (Probst et al., 2000), lack of time (Keegan & Turner, 2001) and lack of trust (Evans, 2012).

Real and perceived rewards and penalties for individuals that come from sharing and not sharing knowledge also influence the knowledge-sharing process. O'Reilly and Pondy (1980) indicated that the probability that organizational members will route information to other members is positively related to the rewards and negatively related to the penalties that they expect to result from sharing. The relationship between knowledge sharing and incentives was further supported by studies (e.g., Gupta & Govindarajan, 2000; Quinn et al., 1996) finding that significant changes had to be made in the incentive system to encourage individuals to share their knowledge, particularly through technology-based networks in organizations. Rewards have also been considered important to knowledge sharing within intranets (Hall, 2001), in the creation and sustenance of knowledge-sharing networks (Dyer & Nobeoka, 2000), and the success of knowledge-management initiatives within organizations (Earl, 2001; Liebowitz, 1999).

O'Dell and Grayson (1998) highlighted the lack of time as a common sharing barrier, concluding that even though managers are aware of the benefits of knowledge sharing, they often struggle to implement knowledge sharing due to time constraints. Time restrictions are also a reason why people may potentially hoard their knowledge rather than spend time to share knowledge with others. Instead people naturally focus on those tasks that are more beneficial to them (Michailova & Husted, 2003). As such the time to share knowledge can be seen as a cost factor, either in transferring it from one person to the next or from a tacit into an explicit format (Grant, 1996). In a study of 19 companies across Europe, the lack of time was found to be one of three impediments to the transfer of project knowledge. Without adequate time for reflection on the outcomes of actions (what happened, how, why and what might be improved), or adequate attention to feedback and alignment mechanisms within project teams, the lessons emerging from the collective actions of project teams are easily lost. Clearly if no 'lessons learned' are placed on the database because of pressure of time, then the exploitation of the knowledge will not occur as anticipated (Keegan & Turner, 2001). Consequently, it is important that work

processes offer enough space to allow people to take time to generate and share knowledge and then also identify those who may be interested in sharing it.

Another barrier to knowledge transfer is lack of trust. Most people are unlikely to share their knowledge without a feeling of trust: trust that people do not misuse their knowledge, or trust that knowledge is accurate and credible due to the information source (e.g., Orlikowski, 1993; Pfeffer & Sutton, 2000; Pan & Scarbrough, 1998; Ruppel & Harrington, 2000). A detailed assessment of the quality of external tacit or explicit knowledge is often impossible due to source and time constraints. It is mostly in informal networks that people trust each other, voluntarily share knowledge and insights with each other, and collaborate actively and willingly. Evans's (2012) doctoral dissertation showed a positive relationship between trust and knowledge sharing behavior in organizations. For example, Renzl (2008) study found a direct positive relationship between trust and knowledge sharing behavior within and between project groups in two large organizations. A study of scientific staff representing 5 partner organizations at a Bio-Medical Consortium found trustworthiness among co-workers to positively affect knowledge sharing activities (Andrews & Delahaye, 2000). Their study established that in the absence of trust, formal knowledge-sharing practices were insufficient to encourage individuals to share knowledge with others within the same work environment. Trust was also found to have a significant positive effect on knowledge sharing in two research studies conducted at three large technology companies implementing knowledge management Taiwan (Ho et al., 2010; Ho, Kuo, & Lin, 2011).

The perceived power derive from possessing information or knowledge, inequalities in status, and perceived lack of job security also present barriers to knowledge sharing and learning. In the old school of thinking where profitability was reflected by an organization's output, knowledge hoarding rather than sharing was believed to benefit career advancement. Knowledge sharing often was regarded as weakening an employee's corporate position, power, or status within the company (e.g., Probst et al., 2000; Tiwana, 2002). In his analysis of organizational information processing, Huber (1982) stated that (a) individuals with low status and power in the organization tend to direct information to those with more status and power, and (b) individuals with more status and power tend to direct information more toward their peers than toward those with low status and power. These findings are supported by research done by Allen and Cohen (1969) and Barnlund and Harland (1963). Empirical evidence also indicates that individuals tend

to screen information that is passed upward in organizations, withholding or refraining from sharing information that would be unfavorable to the communicator (O'Reilly, 1978; Read, 1962) or that which would make them vulnerable (Weiss, 1999). Even today, there often is a fear among employees that sharing knowledge reduces job security, because people are uncertain about the sharing objectives and intent of their senior management (Lelic, 2001). According to Reige (2005), lower and middle level employees often hoard their knowledge intentionally, expecting that their superiors may not promote them if they appeared to be more knowledgeable than them. For example, Michailova and Husted (2003), studied knowledge sharing in Russian organizations and found that managers are often resistant to, and dissatisfied about, working with people from hierarchically lower levels and even more so learning from them.

2.6.2 Organization-Centered Barriers

Some studies have shown that an open and flexible organizational structure best supports the sharing of knowledge (e.g., De Long & Fahey, 2000; Nonaka & Takeuchi, 1995; Probst et al., 2000) and that organizational structure is more important for effective knowledge sharing than are organizational culture and information technology (Zhou & Fink, 2003). In contrast, a strong focus on hierarchies and internal regulations create a business environment and workplace climate where employees are expected to rigorously perform according to organizational rules and procedures, thereby constraining effective knowledge sharing practices by, for instance, punishing mistakes and failures (Michailova & Husted, 2003). According to Szulanski (1996), intra-firm exchanges of knowledge are embedded in an organizational context. Like a plant, knowledge that unfolds in one context may grow poorly in another or stagnate in a third. An organizational context that facilitates the development of knowledge provides fertile ground for project-based learning while one organization that does not, discourages learning.

Another barrier to project-based learning is an organization's culture – the way things are done. Organizational culture is typically defined as a complex set of values, beliefs, assumptions and symbols that define the way in which an organization conducts its business (Barney, 1986). Organizational culture is comparable to the spirit of a company, reflected in its goal orientation and dominated by, for instance, financial figures, innovations, or a marketing culture with a strong customer focus. Culture has pervasive effects on an organization because it not only defines who its relevant employees, customers, suppliers and competitors are, but it also defines

how a firm interacts with these key actors (Louis, 1983). McDermott and O'Dell (2001) emphasized the importance of integrating knowledge sharing into existing values and the overall style of an organization to reach a high degree of interaction on vertical and horizontal, rather than changing the corporate culture to suit knowledge sharing.

Many of the challenges encountered in project-based learning have to do with inefficiencies in the learning process or the lack of a learning process to begin with. In most organizations, it seems that lessons learned, if they are captured at all, are captured on an ad hoc basis or captured only within one segment of the organization. Mistakes are often repeated and successes are difficult to recreate. For example, a survey of NASA's lessons learned processes, found that there was no assurance that lessons learned were applied, staff were not familiar with lessons learned processes across centers/ programs, and there was an apparent lack of support from agency leaders (Maya, 2005). An investigation of lessons learned processes in 2,400 organizations found strong evidence that most organizations use inadequate processes to disseminate lessons learned from projects (Fisher et al., 1998). Inasmuch as lessons are collected, verified and stored, they are not effectively distributed, limiting their application and intended benefits.

Another study by Secchi et al. (1999) found that only 4 of the 40 organizations that responded to their survey used software to support the collection, storage and dissemination of lessons learned. In both surveys, none of the responding organizations had implemented an active system for lesson dissemination. This was probably because software was not used to control the processes targeted by the lessons, or the lessons elicited were immediately or manually incorporated into the targeted process. Other researchers have found that only a few companies examine their completed projects in any depth (Gulliver, 1987) or manage to systematically identify and transfer valuable knowledge from one project to other projects (Disterer, 2002). Additionally, improvement reviews were found to be a low priority, only conducted on select projects (Lilly & Porter, 2003).

Another learning barrier related to organizational process is the incomplete capture, evaluation and feedback from learning activities. For example, the documentation of project lessons may be incomplete because the project team members have not been trained on how to properly identify and record lessons learned. When lessons are not properly stored, they may be impossible to retrieve at a later date. In complete information may also be a result of lack of time

to do a proper job or lack of motivation on the part of those providing feedback (e.g. customers and suppliers).

Projects (and programs) have limited resources allocated for the completion of specified tasks within a limited time. It is therefore difficult for managers to release these resources to competing tasks that may not be perceived as contributing directly to achieving the objectives of the project at hand. Resource constraints may include the lack of people (human resources) to perform certain tasks, the lack of money (financial resources) to purchase equipment or pay for some repairs. The absence of these resources affects learning when project team members are not able to apply them to meet learning needs.

2.6.3 Technology-Centered Barriers

Another barrier to project-based learning relates to problems with technology. There is little doubt that technology can encourage and support knowledge transfer processes by making the manipulation of knowledge faster, easier and more effective. The key issue, however, is to choose and implement a suitable technology that provides a close fit between people and organizations (Riege, 2005). In the case of learning and knowledge sharing technologies e.g. groupware, mismatches with employees' needs and requirements can present barriers to the effective use of these applications. When this happens, it is not because of technical problems but because actual problem solutions do not match people's information need requirements (O'Dell & Grayson, 1998). Software systems should support work-related processes of individual project team members who decide which information to access, store, or share with their colleagues. This is not because of technical problems but because actual problem solutions do not match people's information need requirements (O'Dell & Grayson, 1998).

Technological barriers could also be a result of the complexity of the technology, in cases where project team members just don't know how to use the technology to obtain the results required. In other cases, employees may not admit their ignorance for fear of appearing aged or incompetent, compared to younger employees who can easily use multiple applications. This fear of judgement prevents employees from asking for help, even where the solutions may not be complicated.

2.6.4 Barriers Related to Knowledge Type

The type of knowledge to be transferred can present barriers to the knowledge transfer process. It is generally agreed that there are two types of knowledge; tacit and explicit (Nonaka, 1995). Tacit knowledge resides in the minds of individuals while explicit knowledge is contained within the organization. Explicit knowledge can be expressed in formal, systematic language and shared in the form of data, scientific formulae, specifications, manuals and such like (Nonaka et al., 2006); It can also be readily transmitted to others through structured processes such as information systems (Martensson, 2000).

Tacit knowledge is the cumulative store of the experiences, mental maps, insights, acumen, expertise, know-how, trade secrets, skill sets, and learning that an organization has, as well as the organizational culture that has embedded in it the past and present experiences of the organization's people, processes, and values. It is usually either localized within the brain of an individual or embedded in the group interactions within a department or a branch office. Tacit knowledge is difficult to exploit organizationally even when it is clearly articulated (Nonaka, 1994). This is because to appropriate knowledge from someone else requires having a shared mental model or system of meaning that enables the other to understand and accept that knowledge (Wenger, 2000). The key to tacit knowledge acquisition and transfer is access to a wide range of activities, to ideas of other people, to information, and to opportunities for participation.

Knowledge management research has extensively discussed the relative importance of explicit (or codified) knowledge and tacit knowledge for organizational activity. This debate has been polarized into two extreme positions, termed the "absolutist positions on codification and tacit knowledge" (Ancori et al., 2000, p. 257). The codification perspective proposes that all knowledge can be codified. This position is most closely associated with approaches that consider knowledge management to be primarily about extracting and disseminating knowledge held by individual employees so that it becomes available to the organization as a whole (Brady et al., 2002). Advocates of codification argue that it reduces the cost of knowledge acquisition due to the ease of storage, retrieval and reliability. As an outcome, the economic properties of codified knowledge are very much similar to the economics of information (Arrow, 1984). There are high initial fixed costs, but since messages become reproducible successive operations can be carried out at very low marginal cost. Through codification, complexity can be reduced when

confining the description and analysis of a domain into what is expressible in codes (Boisot, 1995). This means that some forms of codified knowledge can instruct machines, as is the case with computers, which then can substitute for people in certain situations.

Due to the often public nature of codified knowledge, codification has the potential to reduce asymmetric information in markets. Moreover, codification may transform knowledge into a commodity (e.g., software), that can be bought and sold in markets, thereby allowing firms to purchase knowledge instead of developing it internally (ultimately lowering costs for knowledge acquisition, e.g., through outsourcing). Through the creation of a memory external to individuals, codification may make organizations less vulnerable to loss of tacit knowledge stored in individuals (Prencipe & Tell, 2001).

On the other hand, the absolutist tacit perspective proposes that all codified knowledge requires tacit knowledge in order to be useful. Advocates of tacit knowledge point to the drawbacks of organizations' over reliance on the codification of knowledge. For instance, the inherent flexibility in the skilled use of tacit knowledge seems to suggest that the exercise of such skills involves more than the internalization of codified rules (Nightingale, 2001). If followed accurately and precisely, codified knowledge, understood as rules, may instead imply rigidity. Hence, in the context of change, excessive reliance on codification can stifle the development of new knowledge and inflict stability and inertia on systems. Moreover, the production of codified knowledge implies the production of new forms of tacit knowledge, due to the contextual nature of economically valuable knowledge. In addition, and implicit in this, non-algorithmic judgement is necessary even in contexts where it would seem that complete codification is possible (Ancori et al., 2000).

This critique of codification to some extent highlights the individual, cognitive limits on articulating and assimilating knowledge (Steinmueller, 2000). Nevertheless, the main argument against the strong codification position concerns the need to understand knowledge practices as mediated, situated, provisional, pragmatic, context-dependent, distributed, and contested (Blackler, 1995), where "organizational learning is as much about act and artifact as their meaning as it is about cognition" (Yanow, 2000, p. 262). Drawing on activity theory (Engerstrom, 1987, p. 190, 193) and situated learning (Lave & Wenger, 1991; Wenger, 1998), knowledge (or more accurately, knowing) is depicted as a crucially practice-based activity which is inseparable from the social and historical context within which it takes place and which, in

turn, it helps to constitute. Knowledge is not what resides in a person's head or in books or databanks. Instead, "to know is to be capable of participating with the requisite competence in the complex web of relationships among people and activities" (Gherardi et al., 1998, p. 274).

The explicit and tacit dimensions discussed have quite different implications for how far it is possible or desirable to actively manage knowledge. For proponents of codification, knowledge is a commodity which can be captured, moved around, accumulated, and further developed through conscious manipulation (Brady et al., 2002). It is essential to separate knowledge from the original context of its creation and disembody it so that the organization is not over-dependent on what any single individual knows (Marshall & Sapsed, 2000). However, for those who privilege tacit knowledge, there are important limits to how far knowledge can be decontextualized. While knowledge can be captured and stored in records, each occasion of re-use requires that actors develop a common information space in which meanings are developed (Bannon & Kuutti, 1996). Additionally, the negotiation of meaning is intimately tied to participation in shared collective practices (Brady et al., 2002). Nonetheless, it is easy to assume that understanding is so closely tied to involvement in a localized context that meaning is impossible with any degree of separation from this context. At its most extreme, the strong position on tacit knowledge tends to over-emphasize the *stickiness* of knowledge (Von Hippel, 1994; Szulanski, 1996).

> *Stickiness* is the incremental expenditure required to transfer a unit [of information/knowledge] from one place to another, in a form that can be accessed by the recipient. When this expenditure is low, stickiness is low; when expenditure is high, stickiness is high (von Hippel, 1994, p. 430).

Knowledge is inherently sticky and must be given meaning through active networking and interactive processes which allow those involved to engage in negotiation and sense-making (Weick, 1990). Taken in isolation, neither approaches that emphasize codification nor those which privilege tacit knowledge are adequate. Cook and Brown (1999) argue that explicit knowledge and tacit knowledge are not straightforward substitutes for each other, but are complementary and mutually supporting, brought together in a generative dance. An ideal approach to project-based learning would bring together the strengths of tacit and explicit dimensions and use one to enhance the other.

2.6.5 Project Characteristics

Projects and programs as forms of temporary organizations have characteristics which pose specific challenges for project knowledge management and transfer (Schindler & Eppler, 2003; Love et al., 2005; Fong, 2005; Koskinen & Philanto, 2008). For example, projects and other forms of temporary organizations usually have a rather short-term orientation with a focus on immediate deliverables. However, knowledge management and learning require a long-term perspective as there is often a time-lag between the initial investment in knowledge management systems and the return on investment. This may result in an insufficient transfer of knowledge between projects and from projects to organization (DeFillippi & Arthur, 1998; Love et al., 2005) and thus account for some of the challenges in transferring project knowledge.

Most of the learning generated during project execution is lost to the organization and does not transfer to subsequent projects when project teams disperse at the end of a project. Project team members may be reassigned to new projects, return to their line functions or leave the organization, especially if they were contracted for the project duration (e.g., consultants). This breakup of the project team leads to fragmentation of collective team knowledge since individuals walk away with their experiences. Unless a systematic effort is made to capture the project team's knowledge before project end, this knowledge may be lost and become very difficult to retrieve (at an organizational level) since only parts remain in the private, personal networks of previous team members (Prencipe & Tell, 2001; Kasvi et al., 2003). When a project ends, inevitable discontinuities occur in the flow of resources -- especially personnel and information -- across time and space, and this affects learning from one project to the next. Capturing and diffusing knowledge and learning across projects (or even between project phases) therefore become difficult (Gann & Salter, 2000; Katz & Allen, 1982).

Project teams are often prejudiced against the applicability of the knowledge generated from projects that are perceived as unique, assuming this knowledge may not apply to their project's objectives (Fong, 2008). Some have argued that the one-off and non-recurring nature of project activities provides little scope for routinized learning (Winch, 1997; Hobday, 2000) or systematic repetition (Gann & Salter, 2000). "If an organization thinks it has a unique situation, it is unlikely to gain from the experiences of past works or others. Yet, true systemic causes and transferable project management lessons are there to be learned" (Cooper, 1994, p. 15).

In summary, notwithstanding the personal and organizational benefits of project-based learning, project teams are often reluctant to engage in deliberate learning activities. Fong (2003) observes that there is an assumption that learning occurs randomly and will appear uninhibitedly during the project. However, in the face of numerous barriers that include personal, organizational, technological, knowledge-type to project characteristics, learning in projects requires deliberate attention, commitment and resources (Sense & Antoni, 2003).

2.7 Summary of Literature Review

The foregoing review examined the literature on project-based learning with a focus on five aspects. First, the review defined the nature and form of project-based learning, distinguishing it from the similarly named pedagogical practice of engaging students in complex problem solving over an extended period of time. Within the context of organizational learning, projects may learn lessons from early phases and apply them to improve outcomes in later phases of the same project (intra-project learning) or, they may learn from completed projects and apply the lessons to new projects in the future (inter-project learning).

Second, the review highlighted two main approaches to project-based learning; cognitive and community. While the cognitive approach is concerned with codification, retention and circulation of project knowledge, the community approach is concerned with articulating project knowledge and collectively negotiating its meaning.

The third aspect of the literature review are the benefits of project-based learning to participating organizations. These include improved work performance, increased problem solving efficiency, higher innovativeness, increased market share, and higher productivity, among others.

The literature review then explored different learning practices used in contemporary organizations and their prevalence. Several formal and Informal practices were discussed in the literature with post-project reviews and lessons learned cited as best practices. However, research evidence showed that these formal practices were not widely adopted in practice and where they were used, the process was ad-hoc. Informal learning practices such as asking questions of colleagues and water cooler conversations were also used to acquire and transfer project knowledge.

The final section of the literature review examined barriers to project based learning. Several factors pause barriers to learning from projects including personal, organizational, technological, type of knowledge and project characteristics. Together the learning barriers encountered influence the type and diversity of learning practices adopted to overcome them and meet the learning needs of a given organization.

CHAPTER 3: CONCEPTUAL FRAMEWORK

This chapter presents the conceptual framework used in this study. To develop a conceptual framework for this study, elements were taken from different theoretical propositions to build a scaffold with which to interpret the results.

3.1 The 4I Organizational Learning Framework

According to Crossan et al. (1999), organizational learning is a dynamic process involving tensions between assimilating new learning generated in ongoing projects (exploration) and using knowledge accumulated from previous projects, stored in the organization's knowledge based (exploitation). The authors suggest that: learning occurs across three levels in the organization, i.e., the individual, group and organization levels. At the *individual level*, learning involves developing new insights from one's intuition, their expertise in an area or knowledge from past experiences. Individual level learning focuses on taking experimental actions, breaking out of tradition mind-sets and developing the competencies to do one's job (Bontis et al., 2002). *Group level learning* involves the sharing of individual interpretations to develop a common understanding. Edmonson (2002) explains that group level learning is an iterative action-reflection process that serves either an incremental or radical learning goal for the organization. This implies that group learning is likely to be local (focused on specific group tasks), interpersonal (influenced by individual's perceptions) and variegated (non-uniform in both learning and learning goals).*Group learning* captures the process of integrating. It includes such elements as effectively working in groups, having productive meetings, having the right people to address the issues, and encompasses key elements of dialogue including being prepared to share successes and failures, encouraging diversity, and effective conflict resolution. Organization level learning represents the translation of shared understanding into new products, processes, procedures, structures and strategy (Crossan et al., 1999). Learning at the organization level involves embedding individual and group learning in the non-human artifacts of the organization that endure even though individuals may leave. These artifacts make up organizational memory (e.g. libraries, databases, routines, rules, codebooks, etc.). And that the levels are linked by four processes, i.e., intuiting, interpreting, integrating and institutionalizing (the 4Is).

Intuiting occurs at the individual level and is the preconscious recognition of the pattern and/or possibilities inherent in a personal stream of experience (Weick, 1995, p. 25). Individual-level learning may also be conscious (e.g., social cognitive theory of Bandura, 1986). *Interpreting* is the explaining, through words and/or actions, of an insight or idea to one's self and to others. This process goes from the preverbal to the verbal, resulting in the development of language. *Integrating* is the process of developing shared understanding among individuals and of taking coordinated action through mutual adjustment. Dialogue and joint action are crucial to the development of shared understanding. This process will initially be ad hoc and informal, but if coordinated action taking is recurring and significant, the knowledge will be institutionalized. Institutionalizing is the process of ensuring that routinized actions occur. Tasks are defined, actions specified, and organizational mechanisms put in place to ensure that certain actions occur. *Institutionalizing* is the process of embedding learning that has occurred by individuals and groups into the organization's systems, structures, procedures, and strategy. The processes naturally flow from one into another and it is difficult to define precisely where one ends and the next begins.

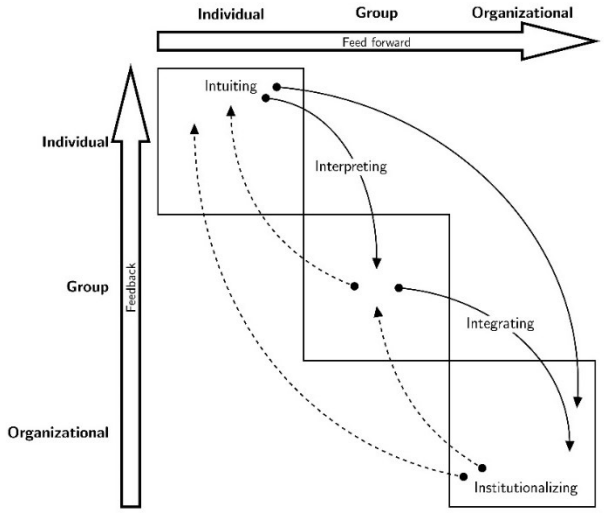

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Figure 1. Organizational learning as a dynamic process

Adapted from Crossan et al, 1999, p. 532 by G. Newton, 2015, CC License.

In the project-based organization, knowledge is created in the feedforward direction from intuiting through interpreting and integrating to institutionalization. However, moving from

interpreting to integrating requires a shift from individual learning to learning between individuals or among groups. This process entails taking personally constructed cognitive maps and integrating them in a way that develops a shared understanding among the group members. There are many challenges in changing an existing shared reality. The first is that individuals need to be able to communicate, through words and actions, their own cognitive map. Since many aspects of cognitive maps are tacit, communicating them requires a process of surfacing and articulating ideas and concepts (Polanyi, 1966). Assuming that individuals can surface and articulate their maps, a second challenge arises from the collective interpretation of the maps. Making something explicit does not necessarily mean the understanding is shared. Imprecision of language is complicated by cognitive maps that act as unique filters on the communication; "we tend to *see/hear what we believ*e rather than *believe what we see"* (Crossan et al., 1999, p. 533). The real test of shared understanding is coherent action. Yet, for novel ideas, shared understanding may not evolve unless shared action or experimentation is attempted. The learning perspective suggests that leading with action, rather than bluntly focusing on cognition, may provide a different migration path to shared understanding. As in experiential learning (Crossan et al., 1995), action provides the opportunity to share a common experience, which may aid in the development of shared understanding.

The interaction between institutionalizing and intuiting provides feedback to the project-based organization. However, institutionalization can easily drive out intuition. Intuiting within established organizations with a high degree of institutionalized learning requires what Schumpeter (1959, as cited in Crossan et al., 1999) refers to as creative destruction: destroying, or at least setting aside, the institutional order to enact variations that allow intuitive insights and actions to surface and be pursued. This is extremely difficult because the language and logic that form the collective mindset of the organization and the resulting investment in assets present a formidable fortress of physical and cognitive barriers to change. Further, members of the organization must step back from proven, objective successes and allow unproven, subjectively based experimentation. The tension between exploring new learning (feed forward) and exploiting what has already been learned (feedback) arises because the institutionalized learning (what has already been learned) impedes the assimilation of new learning. "Fully assimilating new learning requires the feed forward of learning from the individual and group to become institutionalized within the organization" (Crossan et al., 1999, p. 533).

Organizational learning researchers (e.g., Crossan et al., 1999) perceive learning as a more or less smooth cycle involving the conversion of knowledge from one type or level to another. The general presumption is that there is some basic continuity across tasks within the organization which provides the conditions for organizational learning (Swan, Newell & Scarbrough, 2010). Based on this assumption, Edmondson (2002) proposed that "the collective learning process in an organization is inherently local" (p. 42), essentially equating organizational learning to team learning, which is more continuous and cumulative than project-based learning. However, in the context of project-based organizations, learning within projects (intra-project learning) may not translate into learning across projects (inter-project learning), that can enhance higher level organizational learning (Swan et al., 2010). Intra-project learning only rarely transcends different levels to accumulate directly into organizational learning (e.g., Schindler & Eppler, 2003; Keegan & Turner, 2001).

3.2 The Dynamic Capabilities Framework

Dynamic capabilities may be defined as a combination of process routines, patterns of practice and learning, technology, intellectual property, customer base and relations that enable a firm to create new products and services, as well as respond to changing market circumstances (Teece & Posano, 1994, p. 6). At any one point in time, organizations adopt a mix of learning behaviors constituted by a semi-automatic accumulation of experience and by increasingly deliberate investments in knowledge articulation and codification activities (Zollo & Winter, 1999).

Experience Accumulation

The lowest level of learning practices is informal experience accumulation, which refers to the tacit accumulation of experience by individuals over time and the use of that experience to improve practice in an incremental fashion. The notion of *experience accumulation* comes from a traditional view of organizational learning as skill building based on repeated execution of similar tasks, the central learning process by which operating routines have traditionally been thought to develop. Routines may be defined as "executable capability for repeated performance in a context that has been learned by an organization in response to selective pressures" (Cohen et al., 1996, p. 683). They are stable patterns of behavior that characterize organizational

reactions to variegated, internal or external stimuli (Zollo & Winter, 2002). Routines can be characterized by their tacit and programmatic nature (Nelson & Winter, 1982), are an outcome of trial-and-error and reflect the accumulation of experiential wisdom (Gavetti & Levinthal, 2000). Organizational routines are fundamental for firms' capability development for two reasons; first, the smooth functioning of routines creates the possibility for automatic behavior, which requires less attention and effort on behalf of the skilled worker (Penrose, 1959). Second, organizational routines allow for efficient specialization and coordination (Zollo & Winter, 2002). Skilled labor that performs routinized activities can be partitioned using division of labor, hence giving rise to benefits related to economics of specialization.

The accumulation of knowledge through learning by doing and learning by using are based on actions where actors either have difficulties in drawing inferences from or ignore inferences to causality (Levinthal & March, 1993). In such situations, actors learn fairly passively through what Argyris and Schön (1978) labeled single-loop learning. Single-loop learning is a process that maintains the central features of an organization's theory-in-use or set of rules, and restricts itself to detecting and correcting errors within that given system of rules. It is a lower-level type of learning and leads to the development of some rudimentary associations of behavior and outcomes, but these are usually of short duration and impact only part of what the organization does. Lower-level learning is a result of repetition and routine and involves association building. Due to this reliance on routine, lower-level learning tends to take place in organizational contexts that are well understood and in which management thinks it can control situations (Duncan, 1974).

Some routines involve the execution of known procedures for the purpose of generating current revenue and profit. Other routines seek to bring about desirable changes in the existing set of operating routines for the purpose of enhancing profit in the future. Routines of the second type are traditionally identified as search routines (Nelson & Winter, 1982), and are regarded as constitutive of dynamic capabilities. Experience accumulation and organizational routines are fundamental for a firm's capability development. The smooth functioning of routines creates the possibility for automatic behavior which requires less attention and effort on behalf of the skilled worker (Penrose, 1959). Organizational routines also allow for efficient specialization and coordination (Zollo & Winter, 2002). Skilled labor that performs routinized activities can be

partitioned using division of labor hence giving rise to benefits related to the economics of specialization.

Knowledge Articulation

Knowledge articulation is defined as the "deliberate process through which individuals and groups figure out what works and what does not in the execution of an organizational task" (Zollo & Winter, 2002, p. 341). It is the process through which tacit knowledge is expressed through collective discussions, debriefing sessions, and performance evaluation processes. Through agents' abilities to express opinions and beliefs (Zollo & Winter, 2002), and the creation of metaphors and analogies (Nonaka & Takeuchi (1995), cognitive processes drawing more global inferences and determining causalities are triggered.

Knowledge articulation thus occurs when individuals and groups make a cognitive effort to enhance their understanding of the causal links between actions and outcomes – in Edmondson's (2002) terms they engage in collective reflection to gain insight. Knowledge articulation involves the conversion or extraction of tacit knowledge from individuals into explicit and more generic knowledge that aims at explicating causal relationships through collective efforts. The process of knowledge articulation is a social process that occurs in organizational communities, involving the interplay between cognitive frames expressed in theories, coding schemes such as language and pictorial representations, and technologically embedded tools.

At the individual level, the learning practices at the basis of the articulation process are learning by reflecting and learning by thinking. Besides learning by reflecting and learning by thinking, the articulation process also subsumes also learning by discussing and learning by confronting. At the group level, the articulation process improves the understanding of action–performance relationships and enables the creation of agreed upon representations. These representations in turn facilitate communication amongst the actors using the concepts embedded therein (Foray & Steinmueller, 2001). By discussing the role of conversation in the articulation of knowledge through reflection, a collective element of knowledge articulation is introduced (Zollo & Winter, 2002; Schön, 1987). Through dialogue and discussion knowledge can be articulated by organizational members and an arena can be created for double-loop learning (Argyris & Schön, 1978).

Double-loop learning is a higher-level form of learning which aims at adjusting overall rules and norms rather than specific activities or behaviors. The associations that result from higher-level learning have long term effects and impacts on the organization as a whole. This type of learning occurs through the use of heuristics, skill development, and insights. It is therefore a mere cognitive process than is lower-level learning which is often the result of repetitive behavior. The context for higher-level learning typically is ambiguous and ill-defined, making purely repetitive behavior rather meaningless. This ambiguity and environmental complexity characterizes upper management levels of the organization where decision making norms are at least partially determined, that is, where higher-level learning usually occurs. Considerable evidence suggests that some type of crisis is necessary for changes in higher-level learning, for example, a new strategy, a new leader, or a dramatically altered market (Miller & Friesen, I980; Starbuck et al., 1978). The desired consequence of this type of learning is often not any particular behavioral outcome, but rather the development of frames of reference (Shrivastava & Mitroff, 1982), interpretive schemes (Bartunek, 1984), or new cognitive frameworks within which to make decisions. In fact, unlearning may be one of the most important consequences (Nystrom & Starbuck, 1984; Starbuck, I983).

Sometimes the results of higher-level learning become dysfunctional if they create the development of superstitions, associations or norms that support dysfunctional behaviors. Superstitions or organizational success stories can create the inability or unwillingness to change (March & Olsen, 1975; Pfeffer, 1981). The learning can focus on identifying ways of not changing, not experimenting, game-playing, maintaining the status quo, and avoiding problems (Cyert & March, 1963; Lyles & Mitroff, 1980; Nystrom & Starbuck, 1984). This may become much engrained and require shocks, jolts, or crises for unlearning, new higher-level learning, and re-adaptation to take place (Lawrence & Dyer, 1983; Meyer, 1982; Nystrom & Starbuck, 1984).

Zollo and Winter (2002) submit that knowledge articulation performs two roles. First, it constitutes a context for justification (Tell, 1997; Tell, 2000; Grand & Von Krogh, 2000). Second, it is a cognitive process that implies deliberation and carries the possibility that individuals and groups can come to grips with causality and feasibility in relation to performing different tasks (Nonaka & Takeuchi, 1995; Witt, 1998). While potentially requiring significant efforts and commitment on the part of the members of the organization, such articulation efforts can produce an improved understanding of the new and changing action-performance links, and

therefore result in adaptive adjustments to the existing sets of routines or in enhanced recognition of the need for more fundamental change.

Knowledge Codification

Knowledge codification is a step beyond knowledge articulation; the latter is required in order to achieve the former. It is an important and relatively under-emphasized element in organizational learning. Even more so than articulation, the ability to codify knowledge allows for the creation of externalized knowledge, brought forward in linguistic and symbolic representations (Zollo & Winter, 2001). Moreover, codification processes are associated with much effort and high costs. When individuals in organizations codify articulated knowledge into codebooks (Cowan et al., 2000), the aim may be to reveal even stronger links between actions and outcomes. In such cases, efforts may involve the screening of multiple scenarios, different explanatory frameworks, or the testing of different organizing principles.

Codified rules as contained in manuals and procedures can also merely serve to provide guidelines for repetitive actions. In such instances, codification (as an outcome) primarily serves the purpose of facilitating routine replication. The economic benefits of codification lie primarily in the re-use and diffusion of codified knowledge (economics of information). Following Foray and Steinmueller's (2001) discussion, one can distinguish between two functions of codification. The first function is that codified systems of symbols allow for storage and transfer across time and space. The second function of codification is to allow humans to rearrange, manipulate and examine symbols and symbolic relationships in order to transform the underlying knowledge represented in such systems.

Hence, not only is there an aspect of inscribing what is tacitly known involved in codification, but also, as Foray and Steinmueller (2001) emphasized, a higher effect of changing knowledge structures by the potential and actual transpositions implied by such a literate form of knowledge representation. This line of reasoning suggests that besides the substantial cognitive investment in learning by writing and rewriting suggested by Zollo and Winter (2002), organizations learn by implementing, replicating and adapting codified knowledge.

Relationship between the knowledge processes

Experience accumulation, knowledge articulation and knowledge codification are certainly not unidirectional. Moreover, there are overlaps between them and any seemingly definite distinction between them may sometimes blur. Principe and Tell (2001) emphasize an increasing element of deliberation and, in one sense, rationality, as articulation and codification processes are included in an understanding of the creation of organizational knowledge. To borrow Weick's (1995) words, one could say that sense-making processes become an explicit element of the learning processes involved when individuals and communities of individuals create representations which they can use to interpret and elaborate on experiences encountered (Choo, 1998).

3.3 Interpretive Framework for this Study

The purpose of this study was to develop a deeper understanding of how project-based organizations learn from their experiences. The 4I and dynamic capabilities models together, provide important dimensions in understanding the process of project-based learning. First, the three levels of the organization (individual, group, and organization) allow us to explain the transcendence of knowledge beyond the individual to the collective realm where it can be shared, questioned, and manipulated to generate corporate value. The levels also allow us to assign responsibility for learning actions (or inaction). The second dimension of three learning processes (experience accumulation, knowledge articulation, and knowledge codification) provides insight on the knowledge conversions that happen from semi-automatic repetition to higher order manipulation to change the status quo. The two dimensions are presented in a matrix as shown in Table 1.

Table 1. Conceptual Framework

Organizational Level	**Learning Processes**		
	Experience accumulation	Knowledge articulation	Knowledge codification
Individual			
Group			
Organization			

Based on this matrix, learning practices that support each of the three processes can be identified for every level of the organization. For example;

Experience accumulation at the individual level may involve a practice such as job rotation. At the group level, it may involve group think protocols and at the organization level may be concerned with communities of practice.

Knowledge articulation at the individual level may involve thinking aloud. At the group level, this may include project review exercises and may manifest through knowledge retreats at the organization level.

Knowledge codification at the individual level may mean writing in a diary. At the group level, this may involve e writing minutes of team meetings and at the organization level may involve repositories such as databases or corporate libraries.

This framework is used to interpret results on learning practices used in this study. The framework is further discussed in Chapter 6.

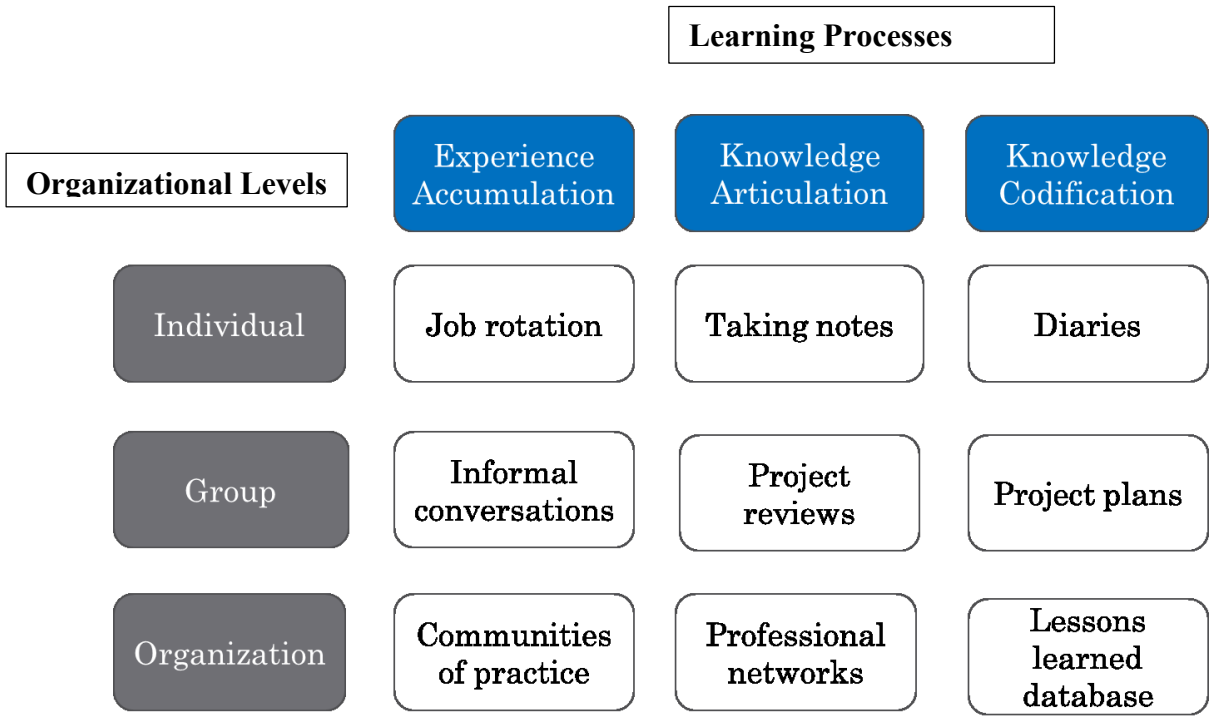

Figure 2. Conceptual Framework

CHAPTER 4: METHODOLOGY

This chapter presents and explains the methods used in conducting the study. The chapter begins with a review of the research questions introduced in Chapter one. This is followed by a description of the research context, participants, data collection instruments and procedures, and data analysis strategies. The research design is explained throughout the chapter. This chapter concludes with a discussion of the study's reliability and validity.

4.1 Research Questions

This study explored the construct of project-based learning. The study was specifically interested in the practices used to acquire, retain, transfer and adapt lessons learned from project to project and from project across the wider organization. To explore these specific elements, the following research questions were addressed:

1. What practices are used to acquire, retain and transfer knowledge across projects and the wider organization?
2. What are the perceived barriers to learning across projects and how do they influence the learning practices?
3. How do organizations differ with respect to learning?

In developing the research questions, this study made several assumptions based on findings from the literature. First, learning is defined as change in behavior or cognition knowledge as a result of experience, with the goal of improving outcomes (Fiol & Lyles, 1985). The agents of learning may include activities, behaviors, practices, events, and artifacts. Second, learning in project organizations involves using these agents to acquire, retain and transfer knowledge between projects and across the organization. Third, learning begins with experience-that which transpires in the organization as its employees perform their tasks (Argote & Miron-Spektor, 2011). The experience may be direct (from organization's personal involvement in events) or indirect (others' involvement in events) and interacts with the context to create knowledge. Thus learning is manifested change (behavioral/cognitive) as a result of previous lived experience(s).

The research questions aimed to uncover practices used for creating, retaining, transferring and re-using project lessons. This study was able to ascertain aspects of the project learning process as viewed by the participants including, opportunities for knowledge sharing and learning, strategies employed, communication modes used, participants' interaction and engagement in activities, events or behaviors that contributed to learning from project experiences and barriers encountered in sharing and learning from project lessons. These questions were analyzed within each case and then across the two cases.

4.2 Research Perspective and Type

This study used a qualitative approach to examine the practices used to acquire, retain and transfer lessons learned from one project to another project and across the wider organization, from the perspective of project team members. The unit of analysis consisted of learning practices. Applying a multiple case study design, data was collected from twenty five semi-structured interviews across two organizations. Interview sessions were recorded and transcribed for analysis. Interview data was supplemented with textual analysis of selected project documents. Combined qualitative data were thematically analyzed to inductively derive research findings.

Qualitative research, according to Creswell (2009), is a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem. The process of research involves emerging questions and procedures, data typically collected in the participant's setting, data analysis inductively building from participants to general themes, and the researcher making interpretations of the meaning of data. Furthermore, Strauss and Corbin (1998) explain that:

> Qualitative research is concerned with developing explanations of social phenomena; it can refer to research about persons' lives, lived experiences, behaviors, emotions, and feelings as well as about organizational functioning, social movements, cultural phenomena, and interactions between nations (p. 11).

Moreover qualitative research aims to help one understand the world in which they live and why things are the way they are. Qualitative research is concerned with finding the answers to questions which begin with: Why? How? And, in what way? It is concerned with the social aspects of the world and seeks to answer questions about why people behave the way they do,

how opinions and attitudes are formed, how people are affected by the events that go on around them, how and why cultures have developed in the way they have, and the differences between social groups (Creswell, 2006). Each of these elements proved useful in the design of this study. Using qualitative methods allowed the researcher to gain insight into project team members' experiences and study the phenomenon of project-based learning in greater detail than quantitative approaches would allow. The goals of qualitative research are summarized in Table 2 (Creswell, 1998; Fidel, 1993; Maxwell, 1996; Patton, 1990).

Table 2. Goals of Qualitative Research

	Goals of qualitative research
1	To establish a rapport with participants and to approach their point of view as closely as possible.
2	To be flexible utilizing few preconceptions and taking appropriate opportunities to adjust the study plan as the research progresses.
3	To make use of multiple data collection sources.
4	To use purposeful sampling.
5	To develop coding and analytic categories with as little pre-determination as possible.
6	To allow for discovery through inductive analysis.

This dissertation used a case study design to investigate practices used for and barriers encountered in project-based learning in two small organizations in Uganda, each representing a single case. The cases were time-bound based on the duration of the data collection period. Case study research is defined as an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context (Yin, 2009). Case study research "focuses on describing, understanding, predicting, and/or controlling the individual, that is, process, animal, person, household, organization, group, industry, culture, or nationality" (Woodside & Wilson, 2003, p. 493). This approach allows researchers "to retain the holistic and meaningful characteristics of real-life events" (Yin, 2009, p. 4). Willis (2007) suggested that case studies are "about real people and real situations … rely on inductive reasoning … [and]… illuminate the reader's understanding of the phenomenon under study" (p. 239). He outlines three specific attributes of case study research:

1. Case study research allows gathering rich, detailed data in an authentic setting,
2. Case study research supports the idea that much of what we can know about human behavior is best understood as lived experience in the social context, and

3. Unlike experimental research, case study can be carried out without predetermined hypotheses and objectives.

A case study method is appropriate when investigating a complex social phenomenon in its real life context, especially when boundaries between phenomenon and context are not clearly evident (Yin, 2003; Creswell, 1998; Eisenhardt, 1989; Fidel, 1984; Miles & Huberman, 1994; Patton, 1990). The richness of the phenomenon and the extensiveness of the real life context require study investigators to cope with a technically distinctive situation in which there will be many more variables of interest than data points (Yin, 2009). In addition, "specificity of focus makes the case study an especially good design for practical problems - for questions, situations, or puzzling occurrences arising from everyday practice" (Merriam, 2009, p. 43) and to gain a comprehensive understanding of a situation. Furthermore, Jones (2007) argued that unlike case studies, other qualitative designs such as phenomenology or ethnographic study are inappropriate for research into the behavioral aspects of knowledge management and may not provide the researcher with a wide range of understanding of the concepts involved.

Yin (2003) suggests three factors to consider in choosing a research strategy: "the type of research question posed, the extent of control an investigator has over actual behavioral events, and the degree of focus on contemporary as opposed to historical events" (p. 5). These three factors contributed to the decision to use multiple cases in this study. First, the phenomenon under investigation is broad and complex, covering aspects of acquisition, retention and transfer of project knowledge and lessons learned across projects, and therefore best covered by a "how" question. Secondly, the study deals with contemporary issues of how project team members transfer knowledge and learn across projects, in their day-to-day work practice. Third, the exploratory nature of the study required an in-depth analysis of participants' perceptions of project-based learning practices used for acquiring, retaining and transferring knowledge across projects. This study did not have control over participants' perceptions. Instead, participants needed to be able to express their opinions and interpret their experiences in their own words. Given this set of conditions, a case methodology was deemed best suited for this study. The present study includes elements of exploration, description, and tentative explanations (Creswell, 1998; Eisenhardt, 1989; Yin, 1994). A case study research design is flexible and appropriate for use in this type of field study where complex factors and relationships were investigated (Carroll

& Swatman, 2000; Eisenhardt, 1989; Fidel, 1984; Miles & Huberman, 1994; Patton, 1990; Yin, 1994).

The multiple-case study research design investigates several cases to gain insight into a central phenomenon (Creswell, 2002; Stake, 2006; Yin, 2003). Multiple cases increase the study's external validity when findings are supported by numerous pieces of diverse empirical data (Neuman, 2006). While most case study research focuses on a single case, often chosen for its unique characteristics, the multiple-case study design allows the researcher to explore the study phenomenon through the use of a replication strategy (Yin, 1994). The replication strategy is comparable to conducting a number of separate experiments on related topics. Yin (1994) distinguishes between literal replication (where the cases are designed to corroborate each other), and theoretical replication (where the cases are designed to cover different theoretical conditions). In the former, cases are purposefully selected to obtain similar results while in the latter, one might expect different results but for predictable reasons. An important element of this replication strategy is the flexibility to add more cases when needed (Yin, 1994).

Based on the exploratory mode of this study, it was not possible to determine before the data collection process the most appropriate theoretical base to use to guide project selection, given the differences in the organizations studied. The decision was therefore made to select projects typical to each organization, as a common point of reference for study participants. Literal replication was achieved by interviewing different participants with similar roles in each case organization. According to the replication strategy, if all or most of the cases provide similar results, there can be substantial support for the development of a preliminary theory that describes the phenomenon under study (Eisenhardt, 1989). The range of similar and contrasting case study interviews that compose each organization add confidence to the findings.

Unit of Analysis

The unit of analysis used in this study was the learning practice. Practices may be defined as recurrent ways of doing things (Corradi et al., 2010). They are complex patterns of human activities (e.g., Gherardi, 2009a; Yanow, 2000; Schatzki, 2002). Practices are determined by the context of use and to a certain extent have a tacit character making them impossible to decontextualize. The tacit elements, in particular, are hard to grasp, as they are embodied in the practitioners and cannot be articulated properly. Hence, practices are 'sticky', which means that

they are hard to transfer (Szulanski, 1996; von Hippel, 1994). In this study, learning practices were empirical instances, such as, lessons learned databases, meetings or informal encounters (Prencipe & Tell, 2001), of activities, behaviors or mechanisms used to acquire, retain and transfer lessons learned from previously completed projects to other projects and across the organization.

In order to empirically investigate learning practices in project-based organizations, it was necessary to find a unit of analysis that could span multiple levels of context, since organizational learning involves dynamic flow of knowledge across the individual, group, and organization levels (Crossan et al., 1999). This study draws from the work of Jarzabkowski (2004) who found that multiple-level research presents a number of challenges; for example, in a multilevel approach, a phenomenon may be investigated at one level of analysis and then examined for veracity at subsequent levels. Alternatively, using a cross-level approach, the phenomenon may be examined for its relationships and interactions across levels, for example between individual behavior, social norms, and contextual influences (Klein et al., 1994; Woodman et al., 1993). The latter method is more applicable to Jarzabkowski (2004)'s definition of strategy as practice since it permits analysis of the interplay between actors, organizations, and wider social contexts. In her work, Jarzabkowski (2004) draws upon institutional theory to frame management practices conceptually as practices-in-use, an extant cross-level unit of analysis present in the interaction within and between levels of analysis (Klein et al., 1999).

The concept of 'use' arises from De Certeau's (1984) study of ordinary actors engaged in using the artefacts of everyday practice to their own ends. Practice is the art of combination, "a way of thinking invested in a way of acting ... which cannot be dissociated from an art of using" (De Certeau, 1984, p. xv). Social structure contains the established practices and artefacts to use for action. These practices are developed with a particular purpose or intent. However, actors also are intentful in their use of these practices and the intent of the actor may not comply with the objective purpose of a particular practice. Thus, the properties of a practice are open to interpretation according to the use to which they are put. Where the intent implied in a practice complies largely with the intent of actors, habitual, routinized use may be expected. In effect, the appropriation of practices for particular, unanticipated outcomes may well involve their adaptation (De Certeau, 1984). The use of practices involved in social structuring provides a

point of interaction between actors, levels of context, and activity. It is, therefore, particularly apposite for this study's concept of practice as interplay and may be used to better explain how learning practices facilitate the transfer of lessons learned from projects to the wider organization. The practice concept has also been used in science (Pickering 1992; Taylor, 1994), technology (Dougherty, 1992; Orlikowski, 2000), accounting (Hopwood & Miller, 1994; Ahrens & Chapman, 2006), and marketing (Hirschman et al., 1998; Allen, 2002).

This study borrows from Jarzabkowski (2004)'s work to identify and define a multi-level unity of analysis: learning practices, which permits examination across individual, project and organization levels of learning. Considering the extant literature on project-based learning, several learning practices are proposed as useful in harvesting, retaining, and transferring project knowledge such as post-project reviews (von Zedwitz, 2002; Schindler & Eppler, 2003; Newell et al., 2006), and lessons learned (Anbari et al., 2008; Bresner & Hobbs, 2004). Practices and learning practices, entail many subtleties and much complexity, and can only be thoroughly explored with qualitative studies. Moreover, practices are situated in a social and material setting (Gherardi, 2006), which calls for investigation of practices in their natural environment (Yin, 2009). Such an investigation is best conducted by a case study design. Case studies are ideally suited to "understand complex social phenomena" (Yin, 2009, p. 2) and allow researchers "to retain the holistic and meaningful characteristics of real-life events" (Yin, 2009, p. 4). The present study employed a qualitative, multiple-case study design.

4.3 Research Context

The research study presented in this dissertation was conducted at two project-based organizations in Uganda; one a telecommunications contractor and the other a development agency. For purposes of confidentiality, fictitious names were used for the organizations in the study. This section explains how the organizations were selected and briefly profiles the corresponding industry sectors, case organizations, and focal projects.

4.3.1 Organization Selection

Several factors were considered in selecting the organizations where this study was conducted. These factors were established based on the research questions introduced in chapter one, as well as the work of qualitative research theorists such as Miles and Huberman. Miles and Huberman (1994) proposed a set of six criteria to guide the selection of cases in qualitative research, which state that:

- the sampling strategy should be relevant to the conceptual framework and the research questions addressed,
- the sample should be likely to generate rich information on the phenomena under study,
- the sample should enhance the generalizability of the findings,
- the sample should produce believable explanations,
- the sampling strategy should be ethical, and
- the sampling plan should be feasible

Drawing on these criteria, this study considered the following: First, the organizations had to be project-based; utilizing project structures to organize work tasks. Second, the organizations had to grant permission to conduct the study and be willing to provide continued access to study participants throughout the length of the study. Third, the organizations had to be involved in a business that generated sufficient data to inform the study and determine relevance to the study's research purpose. Fourth, the site had to have English as its working language so that participants could understand interview questions and that documents exchanged did not have to be translated. Fifth, the organizations had to have learning as one of their main objectives. Finally, the study was contingent on securing funding to cover all the expenses involved (the data collection phase of this study was supported by a field research grant from McGill University's Graduate and Postdoctoral Studies office). These considerations are compared against Miles and Huberman's (1994) case selection criteria in Table 3.

Table 3. Organization Selection Criteria

Miles and Huberman (1994) Case Selection Criteria	**This Study's Organization Selection Criteria**
MH1: Relevance to conceptual framework	• Potential cases should be project-based organizations • Potential cases should have elements of knowledge management in their objectives or work activities
MH2: Potential to generate rich information	• Potential case study organizations should generate enough information – multiple interview participants
MH3: Analytic generalizability	• More than one organization
MH4: Potential to generate believable explanations	• Familiarity with the work of target organizations
MH5: Ethics	• Potential case study organizations should meet ethical guidelines
MH6: Feasibility	• Potential case study organizations should grant permission to conduct the study with continued access to employees • Language of work should be English • Potential to obtain funding for the study

The selection processes targeted five organizations, chosen by industry to present multiple perspectives. These included a university department, a government department, a research institution, a telecommunications company, and a development non-governmental organization (NGO). The government department did not respond to the research invitation. Of the remaining four organizations, the designated contact person at the research institute was not reachable and after several failed attempts, the decision was made to proceed without this institution. Conversations with the university department were very productive; however, after discussing the nature of the research with the university contact and the dissertation supervisor, it was agreed that the telecommunications company (which employs many former students of the university department) was a better fit for this study.

Eventually, the study was conducted in two organizations; a private telecommunications organization and a development non-governmental organization (NGO). The telecommunications and development NGO sectors represent a substantial portion of the Ugandan economy. Telecommunications is the fastest growing economic sector in Uganda, while development NGOs support key sectors such as health, education, and other social

infrastructure services[1]. This approach to case selection by industry has been used by other researchers (e.g., Wastell, 1999; Orlikowski, 1993; Newell et al., 2004).

Each of the organizations studied is relatively small-sized, characterized by an average of about 50 employees. The Uganda Investment Authority (2008) defines a small organization or enterprise as "an enterprise employing 50 people or less, with annual sales or revenue turnover of Ugandan Shillings 360 million (~USD 144,000) maximum and holding total assets of Ugandan Shillings 360 million (maximum)" (p. 6). The organizations also varied by profit and non-profit objectives. Most of the extant literature on knowledge management and learning in organizations has been conducted in the private sector. This study includes the non-profit sector to contribute to this growing area of interest. In addition, studying two organizations instead of one facilitates testing of assumptions against a different set of data thereby improving the study's validity.

4.3.2 Uganda: A brief country profile

Uganda is a land-locked country located in East Africa, about 800 kilometres inland from the Indian Ocean. It is bordered by the Democratic Republic of the Congo to the west, Rwanda to the South west, Tanzania to the South, Kenya to the East and Southern Sudan to the North. Uganda has an area of 241,038 square kilometers and a population of about 39 million inhabitants (ITU News, 2015). Conducting the study in Uganda provided an opportunity to test concepts in contemporary organizational studies research in a setting that is not widely referenced in extant literature. As the world moves from individual to global solutions, studies such as this one are increasingly important in providing tested frameworks of interpretation around which practitioners, policy makers and private citizens from different parts of the world can define common problems and find appropriate remedies for their local contexts.

[1] According to the Organization for Economic Co-operation and Development (OECD), Uganda received an average of 1,673.9 (USD million) in Net official development aid between 2012 and 2013. More than half was spent on the sectors of health (39%), Social infrastructure (17%) and economic infrastructure (12%)

4.3.3 The Telecommunications Sector in Uganda

Uganda Communications Commission (UCC) is the country's regulator of the telecommunications sector. UCC was established in 1998 by the Uganda Communications Act (Cap 106 Laws of Uganda) to facilitate and enable the development of a modern communications sector and infrastructure in the country. As of June 2014, Uganda had eight operational telecommunications companies: MTN Uganda, Uganda Telecom, Airtel Uganda, Africell Uganda, Smart Telecom Uganda, Smile Telecom, K2 Telecom and Sure Telecom. These companies serve about 17 million subscribers out of a population estimated at about 36 million, a 45 percent penetration rate. The sector provides a broad range of services including fixed voice, mobile voice, data and internet, broadband and wireless.

In 2009, Uganda's communications sector was one of the fastest growing in Africa. As in the rest of the continent, this was largely due to the rapid expansion of mobile telephony. The International Telecommunication Union (ITU) reports that, in July 1999, Uganda became the first African country, and only one of a dozen in the world, where the number of mobile users surpassed that of fixed-line subscribers. According to statistics from the UCC, the number of telephone subscribers had reached 10 million in March 2009, up from more than 8.7 million in December 2008, which is about one-third of the country's population. Of the 10 million subscriptions, 9.8 million were mobile phone subscribers while around 200 000 are fixed-line owners. The telecommunications sector's contributions to national GDP increased from 2.6 percent in 2006 to 6 percent in 2010 due to a combination of employment opportunities provided, and attraction of foreign direct investment. The sector contributed more than 200bn shillings in tax revenue in 2010/11 (UCC 2012).

Rapid growth in the telecommunications sector has contributed to the widespread use of project-based forms of organizing to meet the needs of an ever increasing customer base. Project-based organizations can circumvent traditional barriers to organizational change and innovation, since each project is presented as a temporary, relatively short-lived, phenomenon. As such, it does not pose the same threat to vested interests as would the creation of a permanent new department or division (Syndow, Lindkvist & DeFillippi, 2004). Moreover, project-based organizations allow for low-cost experiments and the flexibility to terminate unsuccessful ventures with little disturbance to the organizational sponsor. Because of their limited duration, project-based organizations do not constitute irreversible resource commitments of fixed costs

(DeFillippi, 2002). It is even more important to look at project-based learning in this sector with its potential to impact social-economic development across multiple African communities. Capturing, interpreting and transferring present-day innovations such as mobile medicine and mobile banking, and applying them to solve problems across different sectors is fundamental to learning, further exploration and future innovation.

Case Study One: TeleCo

The first organization studied was a telecommunications company, hereafter referred to as TeleCo, to preserve its anonymity. TeleCo maintains a skeletal administrative staff while all of its operations are conducted in the form of projects. TeleCo is an entrepreneurial partner to telecommunication operators and technology vendors. The organization serves this market with skills, services and products. TeleCo provides complete passive infrastructure solutions for the wireless and wire-line telecommunication industry. Core activities include the full range of services and materials supply required for telecom roll-outs as well as post-installation services such as maintenance and energy management. The parent organization was founded in 1912 and in 1996 started a highly internationalized business operation. Today the organization has 11 separate subsidiaries across Africa and employs more than 500 people.

Established in 1996, the Ugandan office is gradually diversifying its core business as mobile telephony penetration rates increase and the use of telecoms becomes redefined by developments in technology. The Country Manager of TeleCo has a vision of expanding into additional market segments and setting up offices in neighboring countries (e.g., Rwanda and South Sudan) through aggressive business development efforts. In a crowded market, the organization believes that their past successes will help them in the exploration of new business opportunities. TeleCo is a profit based organization, which means that the goal is to generate profit for the organization's owners and stakeholders. The organization has four departments i.e. Operations, Human Resources, Finance & Accounting, including warehousing and logistics and Sales & Customer Support which are involved in supporting any given project. Structurally, work tasks are organized along project lines, with the departmental influence over projects limited to a support role. Projects contracts are typically received through the sales department, negotiated by management and finance departments, and implemented by members of the operations department.

TeleCo is contracted by different telecommunications service providers to operate several short-term projects. Projects durations range from three to six months, some may last only one month and occasionally projects may take more than six months. Typical projects involve installation of masts for mobile phone transmissions and maintenance of these sites. Project team teams rotate from one project site to another and will sometimes return to an old site for equipment upgrades. Information sharing between project teams is usually through conversation and common experiences at the project sites. The challenge for TeleCo was how to transfer lessons learned from their project experiences in Uganda and apply them to recreate their successes in a different country. This prompted the need, within TeleCo's management, to pay close attention to the ways in which and means used to transfer and adapt knowledge from projects such that it can be re-used by others.

Installation Projects

Most respondents indicated having participated in at least one installation project completed within the past six months. Installation is one of the main services offered by TeleCo and every employee gets to work on at least two installation projects in any given year. Typically, installation projects involve collocated civil engineering and electrical engineering teams. The civil engineering team works on making slabs while the electrical team works with active equipment, erecting antenna poles, electrical works and securing the base stations (from which mobile phone signals are transmitted). Other members of the project team include casual labourers who help with construction at the site, riggers who assist in erecting poles and installing antennas, health and safety people and a site supervisor to coordinate all the work. The goal of these projects is to prepare a functional site for a tenant (client). The client is usually a telecom service provider who rents the transmission site (including maintenance services by TeleCo) for an agreed or contracted amount of time. When the contract expires, the lease may be renewed or taken over by another client.

4.3.4 The Development NGO Sector in Uganda

The Ugandan Ministry of Internal Affairs defines a non-governmental organization (NGO) as "any legally constituted private, voluntary grouping of individuals or associations involved in community work which augment government work but clearly not for profit or

commercial purposes" (The National NGO Policy, 2010, p. 12). NGOs may be local, national, regional or international, depending on the geographic scope of their operations. NGOs are involved in many activities, either focusing on single sectors or operating across sectors. Some of the focus areas of NGOs include health service activities (HIV/AIDS), education, economic empowerment of communities, agriculture, the environment, water and sanitation, training and capacity building, peace building and conflict resolution, relief and charity activities. Recently, the range of NGO activities in Uganda has greatly expanded to include work in the areas of macro policy advice, advocacy on a wide range of issues including human and civic rights, integrity and accountability in public office, good governance and democracy, lobbying and research.

In Uganda, similar to other African countries, the post-colonial years have seen a steady increase in the involvement of NGOs in the development process. In part, this reflects frustration and impatience with what is perceived to be failure of government development assistance either to generate growth or to reach the poor (Barr, Fafchamps & Owens, 2005). Since independence, the state in Africa has had to meet the demands of its citizens in conditions of particularly low capacities and severe obstacles. This mismatch between state capacity and the needs of its citizenry, as reflected in the high level of poverty in African states, has prompted advocacy by bilateral and multilateral aid donors for decentralization, incorporating participatory development that involves non-state actors such as NGOs, as alternatives to state models for ensuring development in Africa (Olarinmoye, 2012).

The beginnings of the NGO sector in Uganda were initiated by faith-based organizations, principally large established churches in the 1970s and 80s. This movement was subsequently reinforced by international NGOs, then bilateral donors and, more recently, by the Ugandan government itself (Barr et al., 2005). Today, several faith-based organizations are actively involved in directly meeting the psychosocial needs of orphaned and vulnerable children, running social enterprise projects, and directly operating social infrastructure such as schools and hospitals. For example, 40% of Ugandan hospitals are missionary hospitals with a faith-based connection (Kuchment, 2002). From fairly modest numbers prior to 1986, the sector has seen phenomenal growth. Today, more than 7,000 NGOs are registered with the national NGO Board. They may be broadly classified into two groups, one concerned with development-related projects, the other with a primary purpose of defending or promoting a specific cause. Both

groups combine more elements of political activism and less of philanthropic work (Barr & Fafchamps, 2004).

According to the United Nations Economic Commission for Africa (UNECA), the continent is increasingly becoming a key player in acquiring, generating and applying knowledge to development challenges. Lessons learned by NGOs overtime have contributed to improvements in service delivery, especially in areas such as fostering community participation in NGO activities, greater attention to gender issues, especially the role of women in programs involving health and sanitation, addressing extreme poverty since destitute people cannot subscribe to different programs when their basic needs such as food and shelter are not addressed. Research on project-based learning helps to consolidate what has been learned so far and identify opportunities for improvement. While NGOs work across many sectors of the economy, the ultimate test of their contribution is in empowering beneficiary communities to hold their governments accountable, fight for their rights and works towards improving their circumstances rather than remain perpetually dependent on foreign aid.

Case Study Two: DevCo

The second organization studied was a development agency, hereafter referred to as DevCo to preserve its anonymity. DevCo International was founded in 1956 with the goal of assisting those in need. Today, it has more than 4000 staff with operations in 125 countries. In 1997, the United Nations granted General Consultative Status to DevCo International, giving the organization a unique opportunity and an added voice in the international community. The Ugandan office, here referred to as simply DevCo, was established in 1986 as a national non-profit organizations with operations across the country. DevCo operates along five thematic areas: Primary Health Care, Sustainable Livelihoods, Basic Education, Food Security, Emergency Response and Advocacy. The organization serves communities through project and program activities and investments such as building schools and health centers, drilling community drinking water wells, micro-credit financing options, vaccination programs, and farming.

DevCo is in the process of transitioning from a project-based to a program-based orientation, which will improve knowledge sharing between projects and extend the lifespan of project resources. Projects are defined as temporary work structures with activities clustered

around specific work tasks. When projects continue over a long time, they evolve into programs. Programs consist of a planned series of projects, which may address different objectives but are linked to a common theme.

The management team has a vision of creating a learning organization by improving information sharing within and between programs and thematic areas. DevCo's operations are structured in terms of programs, along the five thematic areas of practice. Each of the themes has a program officer located at the head office, also known as a desk officer, who is responsible for oversight of individual programs. The five desk officers report to a programs manager who has a panoramic view of all the organization's project operations. There are over 20 field officers, also known as project managers, stationed across the country. The field officers are responsible for executing project activities in the community. Each theme may be aligned with several programs. In addition, some programs address issues that cut across themes. The field offices and size of their teams depend on project requirements and available funding. Since field offices are located in the communities, many work with volunteers in the community or partner with local religious, civic and health organizations to respond to the needs of the communities they serve. The challenge for DevCo was to integrate lessons learned across program phases.

Poverty Eradication Program

At DevCo, respondents indicated having participated in the poverty reduction program phase III, which is a continuation of phases I and II. According to the publicly available projects website, DevCo mainly used a service delivery approach to start building the community structures in the areas of Education, Food Security, and HIV/AIDS among others, in the two completed phases. This being the last phase of the program DevCo together with its partners saw it very important to consolidate the program achievements in the first two phases by putting in place a strengthened vibrant, locally rooted civil society which can be a dynamic actor in social, political and economic development processes to ensure sustainable development. Some of the strategies DevCo was using to achieve the objectives of this program include advocacy and lobbying, capacity building, service delivery, and creating networks and partnerships.

4.4 Research Participants

In selecting participants, this study sought to have a typical project team, representative of daily conditions at each of the organizations studied. The study included employees with practical experience of running and managing projects (e.g., project managers, program managers, line managers), as well as individual employees with experience working on project teams to provide technical expertise or administrative support in different roles (e.g., finance manager, technicians). These conditions provided criteria based on which participants were selected; criterion sampling. The overall study was designed to include 30 interview participants, 15 from TeleCo and 15 from DevCo.

The study used purposeful sampling, a technique widely used in qualitative research for the identification and selection of information-rich cases for the most effective use of limited resources (Patton, 2002). This involves identifying and selecting individuals or groups of individuals that are especially knowledgeable about or experienced with a phenomenon of interest (Creswell & Plano Clark, 2011). In addition to knowledge and experience, it is important that individuals are available and willing to participate, and have the ability to communicate experiences and opinions in an articulate, expressive, and reflective manner (Bernard, 2002; Spradley, 1979).

This study used criterion sampling. There are numerous purposeful sampling designs. Embedded in each strategy is the ability to compare and contrast, and to identify similarities and differences in the phenomenon of interest. Nevertheless, some of these strategies (e.g., extreme case sampling) are used to identify and expand the range of variation or differences, similar to the use of quantitative measures to describe the variability or dispersion of values for a particular variable or variables, while other strategies (e.g., homogeneous sampling, typical case sampling, criterion sampling, and snowball sampling) are used to narrow the range of variation and focus on similarities. The latter are similar to the use of quantitative central tendency measures (e.g., mean, median, and mode). Moreover, certain strategies, such as stratified purposeful sampling or opportunistic or emergent sampling, are designed to achieve both goals (Palinkas et al., 2013).

Based on conversations with the management team, I drew up a profile (criteria) of potential participants including department, role, experience in the field, and number of years with the company. Management participation in this process only extended to ideas for developing a participant profile and providing the contact information of a human resources

officer who helped me distribute research invitations to potential participants. The members of the management team who took part in this process where not included in the study. For the purposes of verification and replication, demographic data are provided in Table 4.

Table 4. Description of Study Participants

Case	ID*	Position	Gender	Tenure (Years)	Age (Years)	Education Level
TeleCo	001	Coordination team member	F	4	25	Bachelor's degree
	002	Project Manager	F	4	27	Bachelor's degree
	003	Project team member	M	7	40	Bachelor's degree
	004	Project Manager	M	3	32	Bachelor's degree
	005	Site Supervisor	M	3	35	Bachelor's degree
	006	Management team member	M	9	37	Master's degree
	007	Project Manager	M	4	42	Master's degree
	008	Project team member	M	3	38	Bachelor's degree
	009	Project Manager	M	5	28	Bachelor's degree
	010	Project team member	M	7	42	Bachelor's degree
	011	Site Supervisor	M	5	46	Bachelor's degree
	012	Finance team member	M	3	40	Master's degree
	013	Site Supervisor	M	2	52	Bachelor's degree
	014	Project team member	M	2	27	Bachelor's degree
DevCo	015	Management team member	M	10	42	Master's degree
	016	Program Desk Officer	F	5	37	Bachelor's degree
	017	Program Desk Officer	M	3	36	Master's degree
	018	Program Desk Officer	M	10	48	Master's degree
	019	Management team member	M	6	50	Master's degree
	020	Program Desk Officer	M	12	45	Bachelor's degree
	021	Program Field Officer	M	7	45	Bachelor's degree
	022	Program Desk Officer	M	7	40	Bachelor's degree
	023	Program Field officer	M	5	38	Bachelor's degree
	024	Program Field officer	F	7	42	Bachelor's degree
	025	Program Field officer	F	8	46	Bachelor's degree

ID* Unique participant Identification number

At TeleCo, management revealed that all projects were handled through the operations department. All members of the operations team were eligible to participate in the study. The researcher then identified potential participants across several roles involved in project work and worked with the human resources officer to contact them. These individuals were invited to participate in the study and also asked to recommend colleagues (snowballing) who had either

worked with them on a previous project or were working with them on an ongoing project. Appendix A.1 shows the invitation letter that was sent out to potential participants.

A total of 32 invitations to participate in the study were sent to the operations department. Out of the 32 invitations, 16 affirmative responses were received, of which two individuals did not participate in the interviews due to conflicts in scheduling. A total of 14 (43%) participants from TeleCo took part in the study. Appendix A.2 shows the interview confirmation form that was sent to the participants. Non-participants did not affect representativeness of the results since study participants came from several roles across project different projects.

Fourteen interviews were conducted at TeleCo as indicated in Table 3.3. Participants included 2 females and 12 males. Of the 14 participants, 11 had completed a first university degree (Bachelors), while 3 had completed a Master's degree. The average age of participants was 36.5 years with the youngest at 25 years and the oldest at 52 years. The longest serving employee had been with the company for 9 years while the most junior employee had been there only 2 years. The average tenure was 3 years. TeleCo sometimes hired contract staff to help complete projects on time when there was an upswing in workload. Contract staff were not included in the data collection. Participants were selected from different roles in order to have a representative sample. Five of the participants were project managers, three were site supervisors, one was from the project coordination team, one was from the management team, three were individual project participants and one was from the finance team. Interviewing participants in similar roles had the effect of replicating and confirming participants' perspectives.

At DevCo invitations to participate in the study were extended to desk officers, programs managers and field officers. A total of 20 invitations were sent out. All the desk officers and the programs managers responded in the affirmative. Most field officers and some members of the management team took part in the study. Some field officers were working in the country side and could not be reached in reasonable time, while others had difficulties in scheduling a mutually convenient time to participate in the interviews. A total of 11 participants from DevCo participated in the study. Eleven interviews were conducted at DevCo as indicated in Table 5. Participants included 3 females and 8. Of the 11 participants, 7 had completed a first university degree (Bachelors), while 4 had completed a Master's degree. The average age of participants was 36.5 years with the youngest at 36 years and the oldest at 50 years. The longest serving

employee had been with the company for 12 years while the most junior employee had been there for 3 years. The average tenure was 7.2 years. DevCo occasionally hired consultants in the divestment stage to facilitate end of phase program evaluation. Contract staff were not included in the data collection. Participants were selected from different roles to have a representative sample. Five of the participants were program officers based at the head office, also called desk officers. There were also 4 program officers stationed in different field offices across the country, also known as field officers. In addition, members of the management team at DevCo also took part in the study.

4.5 Data Collection Instruments

Data was primarily collected using in-depth, open-ended, semi-structured interviews. Interviewing was chosen as the main method of investigation because there is a strong indication in the organizational learning and knowledge transfer literatures that the context in which the transfer occurs is extremely important (Szulanski, 1996; Argote, 1999). Interview data was complemented by organizational documentation, including project and program documents. The documents provided background information about the study context and helped to corroborate participants' responses. This section introduces the research participants and discusses the data collection methods.

4.5.1 Interviews

The interview is a method of data collection, information or opinion gathering that specifically involves asking a series of questions. Interviews can be described in terms of "individuals directing their attention toward each other with the purpose of opening the possibility of gaining an insight into the experiences, concerns…values, knowledge and ways of thinking, seeing, and acting of the other" (Schostak, 2006, p. 10). Typically, an interview represents a meeting or dialogue between people where personal and social interaction occur (Davies, 2006). The purpose of the qualitative research interview is "to gather descriptions of the life-world of the interviewee with respect to interpretation of the meaning of the described phenomena" (Kvale, 1983, p. 174). Collecting these descriptions can be done in several ways including unstructured, semi-structured or formal interviews. Semi-structured interviews are usually scheduled in advance at a designated time and location outside of everyday events. They

are generally organized around a set of predetermined open-ended questions, with other questions emerging from the dialogue between interviewer and interviewee (Dicicco-Bloom & Crabtree, 2006).

There are several advantages to using interviews for collecting data, including: richness of data, personal interaction, flexibility, clarification, and interviewee perspective. Interviews allow people to convey to others a situation from their own perspective and in their own words (Kvale, 1996).The interviewer is able to gather complex, in-depth data that is not as easily obtained through other approaches. Interviews usually achieve a high response rate, ambiguities can be clarified during the interview and incomplete answers followed up immediately which increases accuracy of the data collected. Interviewee responses are not influenced by others (as would be in a group setting) and interviewees are less self-conscious in a one-to-one situation. In-depth qualitative interviews are normally flexible and exploratory in nature (Patton, 2002). Interviews can be conducted in a variety of locations and times, allowing for adaptation to interviewee circumstances. Additionally, the interviewer has control over the interview and can keep the interviewee focused and on track to completion.

In as much as interviews have several advantages, there are some disadvantages to consider. The main disadvantages of interviews are time and cost. Interviews can be very time consuming requiring iterations of setting up, interviewing, transcribing, feedback and reporting. Interviews can be costly involving access to interview sites and compensation of participants and research assistants, especially where a large number of individuals have to be interviewed in disparate locations. Moreover, the quality of data received often depends on the ability of the interviewer to elicit responses and willingness of interviewee to corporate. Roland and Wicks (2009) found that the success of a research agenda "will depend upon the willingness of a diverse group of participants to share personal beliefs and doubts, struggles and victories, joys and fears" (p. 262). Finally, different interviewers may not have the same skills and this might affect data collection.

Developing the interview questions

In developing the interview questions, this study identified a typical project (with the help of the executive staff at TeleCo and at DevCo) to provide a common point of reference and focus reflection on project experiences. Reference projects were selected by the organizations studied,

based on a set of guidelines set by the researcher. Since the study examined the process of project-based learning in general, typical projects were considered. The study was cognizant of the difficulties in comparing projects at different phases of their life cycle (Leonard-Barton, 1990) and therefore requested mature projects that were well established in the organization, or projects that had been completed recently (past six months for TeleCo and past one year for DevCo). Using typical projects also improved the internal validity of the study.

The premise of learning from projects is supported by Davies & Brady's (2000) economies of repetition, which can be obtained by learning to improve the efficiency and effectiveness with which project tasks are executed. This study assumed that by choosing typical projects, respondents would be able to recognize and report learning patterns from their own experiences in previous projects. Disterer (2002) posits that project closing is becoming the most important phase to capture new knowledge and prepare the knowledge for transfer to other projects. Based on this information, the researcher asked for mature or previously completed projects, in the hope that participants would have been engaged with a given project long enough to reflect on their experiences.

The interview questions were developed partly from the literature review, the research questions and preliminary conversations with the management teams at TeleCo and DevCo. (e.g., Kotnour, 1999, 2000; Lampel, 2001; Landaeta, 2008; Newell & Edelman, 2008). Interview questions were open-ended to encourage participants to tell their own stories and experiences of project-based learning, rather than constrained and defined answers (Fallon & Brown, 2002; Saunders, Lewis & Thornhill, 2007).

Testing the interview questions

The interview questions were pre-tested with a team of five: two doctoral students and the researcher supervisor, all of whom have project management experience, one project manager, and one research methods instructor. Participants in the pilot test were not part of the main study. The pilot test allowed the researcher to fine-tune the interview questions by clarifying those that seemed confusing or that generated single word or irrelevant responses.

Based on feedback collected from testers, the researcher was able to determine the length of the interview sessions, check questions for clarity and test the digital voice recording device. The pilot resulted in revisions to the interview questions. The wording of some questions was

revised to use more concise words. Also, some questions were revised to reflect language used in practice. A run-through of all the questions was conducted to make sure the length of the interviews did not exceed 75 minutes. The final interview schedule consisted of 20 items, presented in four sections of demographic information, project learning practices, barriers encountered, and possible solutions to project learning. The final set of interview questions used is provided in Appendix A.3.

4.5.2 Document Analysis

According to Prior (2003) "determining how documents are consumed and used in organized settings, that is, how they function, should form an important part of any social scientific research project" (p. 26). Document analysis is the detailed examination of documents produced across a wide range of social practices, taking a variety of forms from the written word to the visual image (Wharton, 2006). The significance of the documents may be located in the historical circumstances of production, in their circulation and reception of the item, and also the social functions, interpretations, effects and uses that may be associated with them.

Documents are a fairly stable source of evidence which can be repeatedly reviewed and usually contain exact names, references and details of an event. The review of documents is an unobtrusive method, rich in portraying the values and beliefs of participants in the setting (Marshall, 2006). In addition, document reviews are relatively inexpensive since the researcher uses pre-existing documents within the organization. The documents are a good source of background information, providing a behind-the-scenes look at a project or organization that may not be directly observable or elicited from interviews. Furthermore, document reviews may bring up issues not raised by other means thereby providing richness of data collected.

The advantages of document reviews are tempered by some disadvantages; for instance, data sources available may be incomplete or inaccurate (Webb et al., 1984). Since different organizations have different practices, the data generated may vary greatly from one organization to the next, making comparisons impossible. In addition, documents may be out of date, disorganized or inapplicable to the purposes of a given research project. Furthermore, document reviews can be time consuming to collect, review and analyze, especially where large document collections are involved. Some documents may be sensitive and not publicly available. The documents may be inaccurate and biased and thus should be used wisely (Yin, 2003). Moreover,

Caulley (1983) cautions that "the facts of history and evaluation never come to us 'pure,' since they do not and cannot exist in a pure form; they are always refracted through the mind of the recorder" especially since the facts we find in documents "have been selected by the recorder" (p. 19).

The documents collected for this study mostly included records on the inner working of projects and programs as recommended by Caulley (1983) and Yin (2003). At DevCo, many of the project documents are publicly available on the organization's website, including: project reports, newsletters, and annual reports. On the other hand, at TeleCo, the researcher had to request for access to documents from the executive team and other participants. Most of the participants did not have authorization to disclose documents. Although the executives shared some documents for this study, they demanded that the information therein be not disclosed, in any form in this dissertation or in any publications resulting from this study. Therefore, since this study was not able to gather sufficient documentary evidence for comparison across both organizations, the documents collected are used only to supplement and provide triangulation for interview data. The documents collected did not result in additional information about project-based learning practices but supplemented the interviews by providing background information about the cases studied. In addition the documents provided evidence of the outcomes of codification practices.

4.6 Research Procedures

4.6.1 Interview Procedures

The interview process itself involved contacting the potential participants, arranging for interviews at their convenience, holding the interviews, taping them, and closing. Aberbach & Rockman (2002) and Creswell (1998) caution that potential participants should be approached with courtesy and persistence. This study was mindful of the participants' work obligations and commitments in scheduling interviews. Interview data was collected over a 2-month period between May and July 2012. Following introductions by the management teams at TeleCo and DevCo respectively, an invitation to participate in the study was sent to all potential participants. Participants who expressed interest were asked to indicate preferred dates, time, and contact phone numbers to schedule an interview. After one week, a reminder was sent to all those who had not yet responded. For those who responded in the affirmative, a confirmation email was

sent with details of the interview and the researcher's contact information. Another reminder was sent to every potential participant, the day before their slated interview session. The reminders and confirmation are provided in Appendix A.2.

A total of 25 interviews were conducted. The semi-structured approach for interviewing (Creswell, 2005) used a fixed set of questions for participants at both organizations. The goal of maintaining the same questions, was to permit valid comparisons of results across the organizations. Due to logistical reasons, there was not much variety in choice of interview location. Interviews were conducted in a meeting room on the premises of each organization, with the researcher and interviewee seated across a table, facing each other. A digital voice recorder was placed on the table in plain sight of the interviewee. At the beginning of each session, before asking the interview questions, each interviewee was informed of their rights and responsibilities as research participants and asked to provide consent. The researcher also informed participants and asked their consent to audio-record the interviews.

At TeleCo, fourteen interviews were conducted across five different roles. The participants included 4 project managers (participants #2, #4, #7, #9), 3 site supervisors (participants # 5, #11 and #13), 1 member responsible for project coordination (participant # 1), a member of the management team (Participant #6), 4 individual project team members (participants #3, #8, #10 and #14), and a member of the finance office (Participant # 12). The first interview was with a project manager and helped set the stage for the rest of the interviews. After the project managers, the finance manager was interviewed, followed by individual project team members, the project coordination team, and then the site supervisors. Members of the management team were interviewed last.

Eleven interviews were conducted at DevCo. The participants included 5 program managers or desk officers (Participants #16, 17, 18, 20 and 22), 4 field officers or project managers (Participants # 21, 23, 24 and 25), and members of the management team (Participants # 15 and # 19). The first interview was with a member of the management team, helping to set the stage for the rest of the interviews. The desk officers (project managers) and management team were interviewed based on availability. Most of the field officers were difficult to reach in a reasonable time, given their location in different parts of the country. The field officers interviewed were attending a training session at DevCo's head office at the time of data collection.

Bradburn, Sudman and Wansick (2004) advise giving participants adequate time during interview sessions to get their thoughts together and then fully express them on the topics discussed. Interview questions were posed by the researcher in the same order in which they appear in Appendix A.3. Participants were given enough time to respond to questions and the chance to ask for clarifications or provide context for their responses if they wished to comment on an aspect of project-based learning that was not included in the initial question. All interviews were conducted in English, since English is the working language of Uganda. Some clarifications were provided using local examples or colloquialisms. For example, all supervisors are generally referred to as 'bosses. Sometimes the researcher referred to the *boss' boss* or the *big boss* (verbally) to indicate a hierarchical relationship but proper titles were maintained in the written text of the interviews, such as project manager or operations manager or country manager.

In scheduling interviews the researcher made sure that each organization had a dedicated day of the week (i.e. Mondays, Wednesdays and Fridays were spent at TeleCo whereas Tuesdays and Thursdays were spent at DevCo). In this way participants would have to wait at one organization while the researcher was delayed at another or stuck in traffic. The researcher paid particular attention to minimizing interruptions in the day-to-day activities of the participating organizations. For participants within the same unit, interviews were staggered such that no two employees from the same unit were interviewed on the same day. Each interview session lasted approximately 1 hour and 15 minutes or 75 minutes.

4.6.2 Document Analysis Procedure

The document analysis process involved identifying relevant project or program documents and accessing them or requesting permission to access them. After the documents had been secured, a system to analyze the information contained in these documents was needed. This study used a simple worksheet adapted from the United States National Archives and Records Administration[2] . The worksheet captures document characteristics such as: title of the document, type of document (e.g., map, report, letter, or newspaper), unique physical qualities of the document (e.g., seals), date of the document, and names of authors or creators of the documents and their positions or titles. The worksheet also captures intended audience of the

[2] http://www.archives.gov/education/lessons/worksheets/document.html.

document, and document information or content. The document characteristics captured can be varied depending on the use to which the worksheets will be put.

Document analysis complements interview data by corroborating participant experiences recorded in the interviews. For example, although document analysis did not yield any new learning practices or additional questions from those identified through interviews, documents of such training reports confirmed participation in training activities reported on interviews. Most documents from DevCo were publicly available from the organization's website. In addition, 5 individual project reports, representative of the organization's thematic areas were provided via email. Table 5 describes the documents analyzed from DevCo. In addition, the table shows number of downloads, where available, for documents mainly accessed from the organization's website.

Table 5. Inventory of Documents from DevCo

Document title	**Type of document**	**Author**	**Date created**	**Intended Audience**	**DLs***	**Content**
Strategic plan 2011-14	Plan	DevCo	2010	All	468	Four year strategy and action plans
Advocacy Policy	Policy	DevCo	11/2011	Employees	631	Structure and Guidance for advocacy work
Partnership policy	Policy	DevCo	09/2011	• Employees • Potential partners	380	Structure and Guidance for establishing partnerships
Organization profile	Fact Sheet	DevCo	06/2012	All	366	Organization profile
Individual project reports	Report	DevCo Staff	Quarterly	All	Paper copy	Summary of project progress
Annual report	Report	DevCo	2012	All	139	Summary of project activities and expenditures
Projects newsletter	Newsletter	DevCo	01/2011	All	403	Description of project activities in specific regions
Projects profile	Database	DevCo	08/2004	All	244	Snap shot of project activities
List of current projects	List	DevCo	2014	All	n/a	Summaries of current projects

Document title	Type of document	Author	Date created	Intended Audience	DLs*	Content
List of current staff	List	DevCo	2014	All	n/a	List of staff and responsibilities
News updates	News stories	Project field officers	several	All	n/a	Updates from project activities in the field
Testimonials of beneficiaries	Stories	DevCo Staff	several	Program Administration	n/a	Recounts of positive benefits from DevCo's activities
Training report	Report	DevCo staff	Several	Program Administration	n/a	Report on workshops and seminars offered/taken
Photo gallery	Photos	DevCo Staff	Several	All	n/a	Photo evidence of DevCo project activities

Notes:

DLs*: number of downloads

Author: Documents are created by staff, as members of the organization, not in their individual capacity. Authorship is therefore attributed to the organization.

The same process was repeated at TeleCo with documents obtained with permission from the management team at TeleCo. Table 6 shows a list of select documents obtained from TeleCo.

Table 6. Inventory of select documents from TeleCo

Document title	Type of document	Author	Date	Intended Audience	Description/purpose
Certificate of registration	Certificate	Govt of Uganda	2008	Regulations	Regulatory document indicating compliance with ISO 9001 for supply installation and maintenance of Telecom network related services
Installation procedure	Manual	TeleCo	2013	Internal	Details process to be followed for civil and fiber works installations
Soil test and design	Flow chart	TeleCo	2013	Internal	Process map
Guidelines for site supervision	Memo	TeleCo	2004, Revised 2010	internal	List of procedures
Quality manual	Manual	TeleCo		All	Describes work procedures and standards of practice

Organization chart	Chart	TeleCo	2013	All	Shows relationships between roles in organization
Vision, mission, and goals	Webpage	TeleCo	c. 2014	All	Action plan, business operations

Notes

Author: Documents are created by staff, as members of the organization, not in their individual capacity. Authorship is therefore attributed to the organization.

4.7 Data Analysis

4.7.1 Transcribing the interviews

The interview sessions were recorded using an Olympus digital voice recorder VN-8100PC and then manually transcribed by the researcher. Transcription by the researcher provided additional opportunities to become familiar with the data. The more familiar the researcher becomes with the data, the better the analysis results are (Hsieh & Shannon, 2005). The researcher used the listen and repeat method (Park & Zeanah, 2005) to help with the transcription. This method allowed the researcher to add explanatory notes and analytical memos and even to begin some preliminary coding during the transcription process.

Data was manually transcribed and analyzed to identify recurring themes and patterns. According to Boyatzis (1998), thematic analysis involves three distinct stages: deciding on sampling and design issues, developing themes and a code, and validating and using the code. In developing codes, the study followed Boyatzis's (1998) description of a good code. Boyatzis proposed that a good code is usable, has high inter-rater reliability and validity, and has five elements: a label (name), a definition of what the theme concerns (i.e. the characteristic or issue constituting the theme), a description of how to know when the theme occurs (i.e. how to flag the theme), a description of and qualifications or exclusions to the identification of the theme and, examples, both positive and negative, to eliminate possible confusion when looking for the theme.

All interview data were stored in a case study database (Figure 3). The transcribed text from each interview session was assigned a filename, indicating which organization it came from and a corresponding participant ID. Each participant was assigned a unique ID prior to beginning the interview sessions, which was later used to anonymously associate their data throughout the

study. The structure of the database consists of a first level of organization, by organization (two organizations studied). Next, data were organized by participants from each organization, tagged by unique ID since some participants had the same role or title. The participant ID can also be used to search within a single organization for all the transcript data associated with a given individual. Finally, the data were organized by research question.

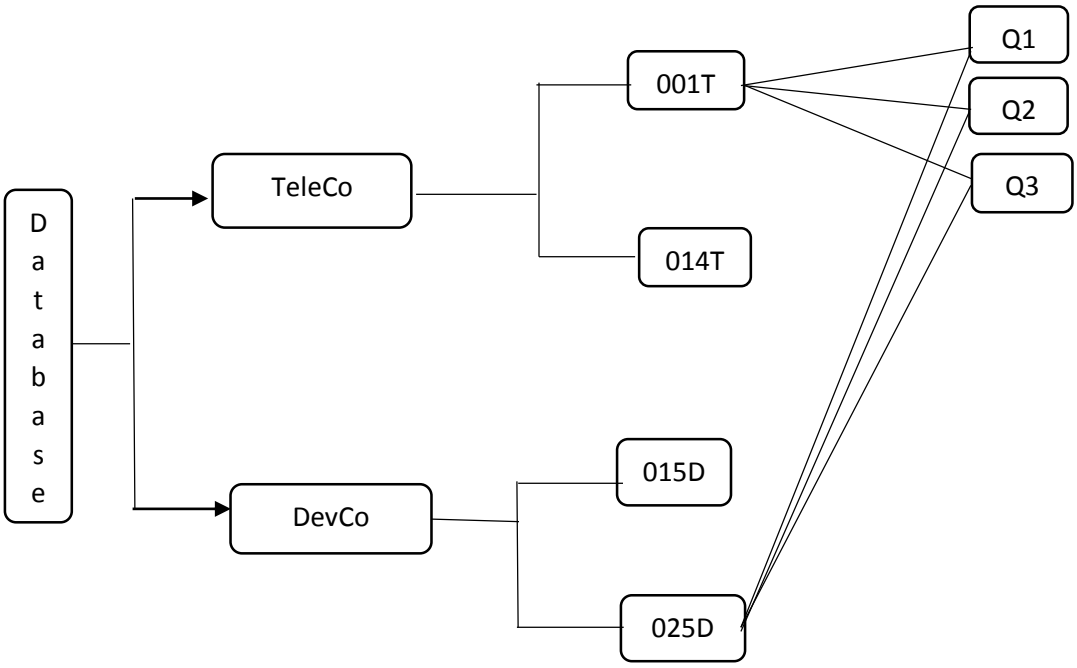

Figure 3. Structure of case study database

4.7.2 Data Coding for Analysis

The unit of analysis for this study was the set of learning practices, common to all projects in the organization. Therefore, that data generated concerned general practices used to acquire, retain and transfer knowledge from completed projects to other projects and across the organization. In addition, data was collected on barriers to project-based learning at the two organizations studied. The data does not provide specific information on individual projects or programs.

In this study, thematic codes were inductively developed from the raw data. Strauss (1987) suggests coding for conditions, interactions among actors, strategies and tactics and consequences. Phrases that are used repeatedly by informants are good leads, often pointing to regularities in the setting (Miles & Huberman, 1994). This study utilized a data driven approach to thematic analysis (Boyatzis, 1998). The steps followed in thematic analysis are summarized in Table 7.

Table 7. Stages in Thematic Analysis

Stages of analysis	**Description**
1	• Decide on sampling and design issues e.g., coding unit-activities, artefacts, obstacles, purposes, people, roles • Select subsamples • Identify the dependent variable
2	• Reduce the raw information (by reading and re-reading transcripts) • Identify themes within subsamples • Compare themes across sub samples • Create a code • Determine the reliability (check for consistent use across different samples)
3	• Apply the code to the remaining raw information • Determine validity (do codes apply to different cases?) • Interpret results

Coding began by assigning codes to the main variables, project-based learning practices and barriers to project-based learning, to relevant parts of interview transcripts. Learning practices were grouped in three categories according to the knowledge processes of experience accumulation, knowledge articulation and knowledge codification. Learning barriers were grouped in five categories of people, organization, technology, project characteristics, and knowledge-type barriers. As a section relating to or describing a particular code in the text was identified, that code was administered. For example, if a participant said, "I discuss project issues with colleagues and other project team members," this statement was coded as knowledge articulation. The statement could also be further sub-coded as "knowledge articulation – inter-personal interaction" or any other appropriate code that matched the meaning of the text. Effective coding of the text, therefore, requires familiarity with the text and subsequent analysis of segments in order to assign meaning and codes for future reference (Creswell, 2003). The

coding process was intended to move from a descriptive approach to an analytical approach in order to understand the meanings behind the recorded and transcribed text (Ryan & Bernard, 2003).

The analytic approach implies a search for meaning, themes, or patterns in the text, which are then matched to the created categories. In the event that a new meaning, theme, or pattern is discovered that does not match an existing code category, a new code is created. The new code is not part of the provisional coding scheme, in other words, it was not anticipated from the beginning of the coding exercise. The list of codes generated is provided in Appendices 6 and 7.

4.7.3 Data presentation and interpretation

Following the analysis and identification of major themes for learning practices used. The conceptual framework, introduced in Chapter three was used to present the data in the form of a 3x3 matrix in which the three organizational levels (individual, group and organization) are placed against three knowledge processes that support organizational learning (experience accumulation, knowledge articulation, and knowledge codification). In this matrix, learning practices that feed into the knowledge processes can be identified at different levels of the organization.

Data was interpreted based on the clustering or patterning of learning practices along the knowledge processes. Depending on a given organization, the pattern of learning practices across the three knowledge processes was interpreted as a profile, unique to that organization. The profiles differ according to how much emphasis the given organization places on either experience accumulation, knowledge articulation or knowledge codification.

4.8 Research Validation

Qualitative researchers are confounded with issues of research quality when credibility intersects with participants' and intended research purposes. Several techniques are used to enhance the quality and credibility of qualitative analysis including validity, reliability, triangulation and reflexivity of the qualitative researcher.

4.8.1 Ethical Considerations

All the procedures in this study were administered in accordance with the guidelines for conducting research with human subjects approved by the Research Ethics Board Office of McGill University. A copy of the ethics certificate approved to conduct this study is available on file and with the dissertation supervisor. There were no identifiable risks for participating in this study.

Before the start of every interview session, the purpose of the study, research procedures, and confidentiality and anonymity concerns were reviewed with each participant as part of the informed consent process. Caution was taken to ensure that participants felt safe, comfortable and had the freedom to withdraw from the study at any time without recourse. Research data was kept in a secure, password-protected location, only accessible by me and the dissertation supervisor. The data will be kept on McGill University's servers for seven years and then securely destroyed. Study results were written in such a way that the participating organizations and the employees involved in the study remained anonymous.

4.8.2 Validity and Reliability

"Validity is concerned with determining whether a particular form of measurement actually measures the variable it claims to while reliability is concerned with how accurately any variable is measured" (King & Horrocks, 2010, p. 158). In qualitative research design, reliability "refers more to the accuracy of the researcher's description of the research site than to his or her interpretation of what the findings mean or how they are generalizable or how they relate to other research and theory" (Bogdan & Biklen, 2007, p. 274). Singleton and Straits (2005) discuss the qualitative approach to research as achieving "an insider's view of reality" (p. 308). In the context of this study, the insider's view is obtained by accessing participants' learning experiences through interviews. The views are specific to each individual's interpretation of their lived experience. Seidman (2006) argues that consistency across interviews with different participants results in trustworthiness of the data. This study employed a multiple case study design to improve validity by interviewing several project team members in the same role. According to Neuman (2006), multiple cases increase the study's external validity when findings are supported by numerous pieces of diverse empirical data.

The limitations of qualitative research have been well documented (e.g., MacQueen & Milstein, 1999; Mayring, 2007; Fahrenberg, 2003). While critiques argue that the small number of cases limits the generalizability of qualitative results, others have suggested that the concept of validity itself is debatable (Hesse-Biber & Leavy, 2011). Nonetheless, the value of this study lies in its ability to provide insights through detailed descriptions, and to provide directions for future research (Newell et al., 2004).

Hesse-Biber and Leavy (2011) propose triangulation as a means to validate qualitative research. Triangulation is a method of crosschecking data from multiple sources to increase credibility. It is the idea that looking at something from multiple points of view improves accuracy (Neuman, 2006). According to Bogdan and Biklen (2007), the use of a variety of sources supports the reliability of the data because many sources are better than a single source. This study employed triangulation of measures and triangulation of method (Neuman, 2006). In seeking to understand how project teams learn from previous experiences, study participants were asked about practices they used or participated in to: 1) acquire, 2) retain and 3) transfer project learning. In addition, participants identified factors that may inhibit or hinder the three learning processes and these were labeled barriers to project-based learning. Furthermore, research data was collected through: 1) interview-based surveys which focused on individual accounts of learning experiences, and 2) analyses of select project documents which were obtained directly from the organization.

4.8.3 Researcher's Role and Bias

Since the researcher is responsible for eliciting and recording participants' opinions, perspectives and experiences, validity in qualitative research is dependent on the researcher's competency and the rigor employed (Patton, 1990). The role of the researcher is based on merit, time spent in the field, and rapport established with the participants (Creswell, 1994). The role of the researcher assumes that his or her experiences are critical to the merit of the study (LeCompte, Preissle, & Tesch, 1993).

I was born in Uganda and completed my undergraduate studies there before immigrating to the West. Throughout my formative years, issues of development and talk of the need for improvement in every aspect of life were constant themes at school, home and play. However, what had been everyday conversations and background commentary of radio hosts on local FM

stations became questions about the role information played in the average individual's life and if access or lack of access to information had any consequence in my undergraduate thesis. Several years later as I reflect on the present research study, I am aware that the goal of establishing learning practices, systems or mechanisms is to improve the status quo. Learning itself involves acquiring, and retaining new knowledge, transferring it to where it is needed and applying the knowledge to solve new problems. Learning also involves letting so of obsolete or inefficient practices so that mistakes are not repeated. This study provides a framework within which to analyze current practice, identify shortfalls and define context-specific solutions. I have come full circle.

Prior to beginning the data collection phase of this study, I spent a considerable amount of time in discussion (via email, phone calls, skype chats and face-to-face conversations) with the management teams at TeleCo and DevCo in order to familiarize myself with both organizations and their respective activities in relation to my research objectives. During the data collection phase of the study, I was stationed in Uganda over a three-month period and was available at the premises of both TeleCo and DevCo on a regular basis. I also provided my contact information to all research participants and encouraged them to contact me with any questions or concerns about the study.

During my graduate studies, I have had the opportunity to take several relevant classes in the School of Information Studies at McGill University including; Foundations of Knowledge Management (GLIS 661), Intellectual Capital (GLIS 662), Knowledge Taxonomies (GLIS 663), Knowledge Networks (GLIS 664), Research Principles and Analysis (GLIS 611), Research Design in Information Studies (GLIS 704) and Research Paradigms in Information Studies (GLIS 703). In addition, I am an experienced information professional with over ten years work experience in information management settings that involved managing and learning from projects.

Aside from the researcher's role, this study accounts for other forms of bias that may arise from sources such as; key informants, role of respondents, and single coder bias. First, I relied heavily on discussions and correspondence with the key informants to obtain permission for accessing the research sites and design the study. In order to control for key informant bias, conversations with key informants were not included in the final analysis and results of this study. Second, to address the issue of role bias, data were collected from participants with

different roles, such as: project managers, site supervisors, individual project team members, and program officers. To control for single coder bias, the themes and subsequent codes generated from thematic analysis and used in the study were reviewed by the dissertation supervisor.

4.9 Summary

This chapter explained the methods used in this qualitative study of project-based learning. The study used an embedded multiple case study design to explore, identify and describe the practices for and barriers to learning from projects. In total, 25 semi-structured interviews were conducted across two organizations, TeleCo and DevCo. Interview data were transcribed and coded for analysis. Additionally, select documentary sources were reviewed. Combined data were thematically analyzed to generate results using Boyatzis (1998) and Miles & Huberman (1994)'s techniques for qualitative data analysis. The findings of this study are presented in Chapter 5.

CHAPTER 5: RESULTS

The study reported here examined in detail the process followed by project team members in learning from project experiences. This chapter is organized according to the first two research questions posed in chapter one; it first reports the practices used to acquire, retain and transfer knowledge from one project to another and then examines the barriers encountered in using those learning practices. Direct interview quotes are used to highlight and personalize the data. The quotes have been edited for grammatical clarity and participants are only referenced by unique identification numbers.

5.1 Learning Practices Used

Organizations today are looking beyond their industries for successful strategies to deal with increasing complexity in their operational environment(s). Based on data collected from 25 interviews at TeleCo and DevCo, over fifty learning practices were identified. As indicated in Figure 1, more learning practices are common across organizations and fewer are unique to individual organizations.

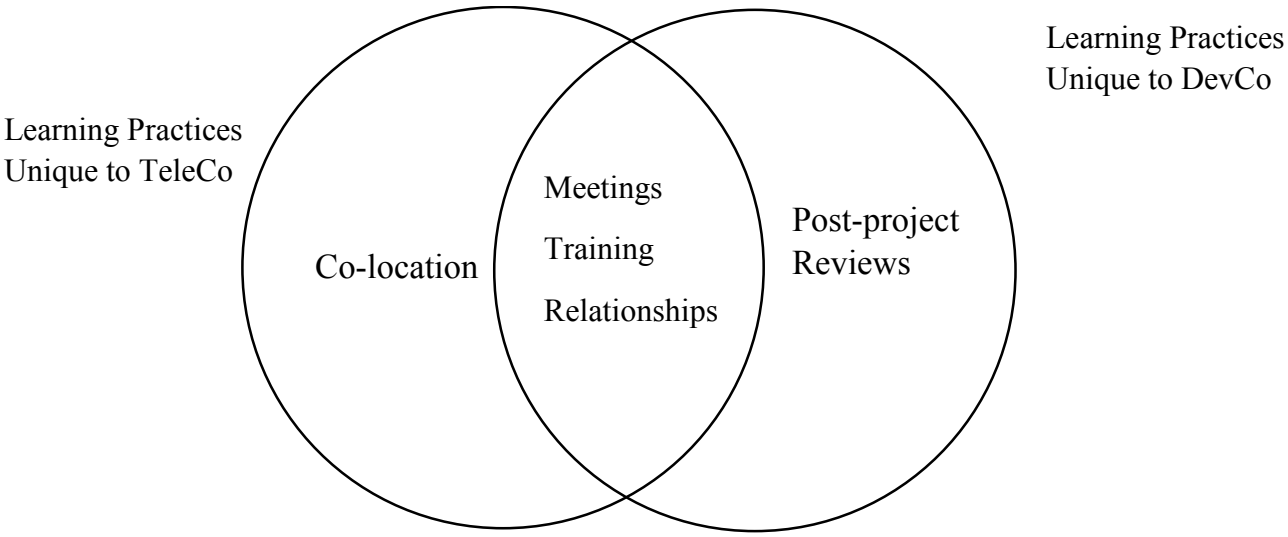

Figure 4. Learning Practices Used

5.1.1 Practices common to TeleCo and DevCo

1. Moving staff around the organization

Participants at TeleCo reported that individual project team members brought their when assigned to new projects. This premise was particularly used in assigning individuals to specific tasks. One project manager at TeleCo explained that:

When deciding which individuals to assign to a given project, I match the project requirements to the experience of the employee in the hope that these individuals will bring their knowledge from previous projects to bear on the current project… Then I consider which individuals have worked together in the past and if that working relationship was a positive one because the work goes faster when the people on the team like each other. (Participant #6)

Participants at DevCo reported that project team members had many opportunities to transfer within the organization at a local, regional and global level within the wider DevCo family for a period of secondment, depending on staff expertise and capacity needs of the unit to which they transfer. A member of DevCo's management team explained:

> *Our employees can take advantage of employment opportunities that come up within the DevCo network and bring their expertise to different parts of the world. We have staff who have worked in Kosovo, the Congo, Haiti, and in other parts of the world where emergency relief and disaster response was needed. When staff transfer to a different DevCo office, they bring their skills to the new assignment and in turn learn different skills from the new office, which enrich the home team upon their return. For example, DevCo worked with the Ugandan Red Cross to provide disaster relief to the victims of the infamous mudslides in the Ugandan country side of Bududa*. (Participant #19)

2. Participating in meetings

Results from TeleCo also showed that meetings were used to share and communicate project information. Project kick-off meetings, described as involving only members of the concerned project, and intended to communicate the client's expectations with the project team and laying out a plan of action were viewed as important in communicating task and role information.

Respondents further expressed disquiet over general, departmental meetings, which were considered as always held to put out flames. One individual project team member described department meetings as *ad hoc* and held irregularly, often times with no agenda or follow-up minutes provided. “Meetings are only held in crisis situations,” he said. Although departmental meetings were regarded as a viable practices for sharing project lessons, their use in the experience of TeleCo was not effective. He explained that:

> *Rather than regular staff meetings, project teams come together at the beginning of every project to discuss requirements and the steps to be taken to meet those requirements. We do not have scheduled meetings to ‘share’ knowledge and insights from completed projects; our meetings are reactive dealing with urgent matters*. (Participant #10)

At DevCo, interview data showed that meetings were used extensively, both internally among program staff externally and with other organizations, to share information and learn from projects. First, a weekly staff meeting is conducted at each of DevCo’s regional offices within the country. The weekly meeting is used to share information and bring staff up-to-date with activities and goals for every new week. Participants also reported attending regular meetings between field and head office program staff. Desk officers reported visiting regional offices where they met with and liaised with field staff in implementing program activities.

In addition, DevCo has a bi-annual program review committee (PRC) which meets every six months to discuss progress of program activities towards pre-established milestones. The PRC meeting is held over a two-day period and brings together program personnel stationed in different offices across the country with head office staff to discuss progress, find solutions to problems, provide explanation, set priorities, and adjust objectives based on discussions and information exchanges among the different project staff.

The management team at DevCo further reported attending meetings, conferences and forums with other country offices within the DevCo family as well as with other organizations that operate in the development sector. As well, the management team held several meetings with local government and administrators in the communities where DevCo operates, and with the beneficiary communities.

3. Participating in training

Formal training at TeleCo consisted of health and safety instruction as well as simulations on the use of new equipment. Equipment training was largely driven by changes in technology and was generally delivered by clients. A site supervisor explained that:

> *Equipment upgrades may be triggered by our suppliers or a new client may present a different generation of technology. When this happens, our staff have to be trained on how to handle the new equipment and associated technology. This involves installations, maintenance and interaction with other pieces of equipment on the same project site. The new equipment may have different energy requirements, requiring some reconfiguration. It is therefore important that all members of the project team are aware of changes and new requirements*. (Participant # 5)

Participants at TeleCo also reported an orientation program for new employees including site tours and pairing them with senior employees. One project manager explained that:

> *We pair new employees with a senior engineer who shows them around the place and helps them to complete the tasks in the TeleCo way, giving explanations of why certain procedures have to be performed and passing on any lessons learned in the process. The new employee has the opportunity to ask questions and discuss project tasks in a safe environment. In turn, the senior employee shares their experiences and tests their knowledge against ideas of the new employee who may suggest other options*. (Participant #2)

Findings from DevCo further showed that project team members participated in different training programs in the form of seminars, workshops and short-term college courses in the organization's core areas of practice. Several employees had attended workshops on advocacy, while others had participated in college courses on disaster response and management and for every employee who attended a training session outside the organization, there was a rule to share what they had learned. A program officer explained the training program thus:

> *In our organization, staff members are sponsored to attend training seminars on a rotating basis. These are usually 3-6 month courses in international development, civic engagement or advocacy. Every quarter, a staff member from a different project/program*

goes for training until everyone has had a chance and then we rotate again. It is the responsibility of the chosen staff member to deliver a presentation when they return from training and share what they learned with the other members of the organization. (Participant #20)

4. Using learning facilitators

At TeleCo, a member of the management team explained that the organization had a loosely defined project coordinator position. The project coordinator at TeleCo is responsible for making sure that all documentation is in order. She acts as a clearing house, bringing together all internal information that the project manager needs to communicate with the client. At the same time, the project coordinator follows up with the client and collects any pending information needed to complete the project. In this way the project coordinator mediates the flow of project knowledge between different parties.

At DevCo, participants reported using consultants to facilitate the program closeout phase. A desk officer explained that at the end of a multi-year program, it was important to step back and reflect of the accomplishments and learning gained. He explained thus:

The consultants provide an independent set of eyes which facilitates the identification of outcomes against objectives set out at the beginning of the project or program. They call attention to mistakes and shortfalls without laying blame since they don't know the team members. In turn, employees are more forthcoming with their ideas. Additionally the consultants make sure that all processes and outcomes are well documented to meet reporting requirements and for future consultation. (Participant #15).

5. Managing stakeholder relationships

At TeleCo, stakeholder relationship management included collecting feedback from clients as well working with different teams to deliver on client specifications. Client relationships were important in TeleCo's kind of work. The client chose which organization to contract, defines project specifications and sets terms of payment. Clients could easily choose another contractor if they were not happy with the service rendered. Therefore communication with the client and keeping them up to date with project milestones was the reason why TeleCo created project progress reports in the first place. Participants reported that clients provided

feedback which was used to improve service. Feedback could be provided to the project manager at the end of a project or during progress meetings where the project manager explained any divergence from project specifications established at the outset.

At DevCo, the organization's programs and activities are solely funded by donors and although the local communities are DevCo's main beneficiary (or client), DevCo had to account for every dollar spent. DevCo's elaborate project monitoring and evaluation system was developed to meet this accountability requirement. The organization's programs are also to a large extent influenced by priorities set by the donors. For example, DevCo had received donor funds earmarked for providing HIV-AIDS treatment and supplying anti-retroviral drugs to infected communities. However, the program manager could not use these funds to buy or repair computers to facilitate this same program. They would have had to use a separate technology or equipment grant.

6. Preparing project documents

Participants at TeleCo reported creating and using different types of documents to facilitate the acquisition, retention, and transfer of project knowledge. Some of the documents collected at TeleCo include a quality manual, organizational chart, installation procedure book, and certificate of registration. Based on analysis of the documents provided at TeleCo, the information captured is mostly prescriptive, consisting of how-to guides and directions on how to meet compliance standards. This information is explicit, easy to codify and distribute for re-use.

Study participants also reported that it was very important to keep the client informed of project progress at all times. TeleCo developed a client relationship management system around these information requirements. Site supervisors are required to compile and upload daily status reports into the project database. These reports were duly communicated to the clients by the project manager on a weekly basis. A site supervisor reports:

> *We produce weekly status reports which help to keep the clients up-to-date with project progress. In these reports we record progress on project tasks, resources used, any changes or deviations from agreed-upon specifications and why. These weekly reports are uploaded and saved on the organization's server in each projects' file. When a project closes, the weekly updates make up the project report*. (Participant #13)

Documenting is a big part of keeping track of work at DevCo. All activities and processes applied towards the achievement of project objectives are documented. In the words of one desk officer, “everything is documented” (Participant #20). Since program activities are supported by donor funds, DevCo has to justify how the monies are spent including records of all activities, receipts of all expenses, and logs of staff time spent on program activities. Although the documents help to easily share program information, respondents expressed weariness at the burden of documentation. A field officer explained that, ‘‘we do so much documenting that sometimes I feel it takes away from getting any real work done” (Participant #25).

Some of the documents accessed from DevCo’s website included project reports, annual reports, strategy documents, and project newsletters. Results of the document analysis show that DevCo captures a rich variety of information from its elaborate documenting system. The bulk of information on the organization’s website concerns program activities. In addition, there are testimonials from beneficiaries which communicate the impact of DevCo’s work to donors and members of the public. Publically available annual reports and financial information provide detailed information about the organization. There are policy documents and procedure manuals with prescriptive information, as well as memoranda of understanding and agreements with different organizations, explaining partnerships and different initiatives the organization is engaged in. Moreover a list of ongoing and previous projects provides quick access to the organization’s operations.

Further to required documentation at project end and other milestones, DevCo encouraged their staff to record learning throughout the duration of the project or program. “Instead of waiting till the end of the program to complete a report, staff were given diaries to record their daily work experiences”, reported one desk officer (Participant #22). The idea was that diaries would help employees to remember details when they prepared project reports several months after the project was completed.

7. Using organizational knowledge repositories

At TeleCo, project information is stored in the projects’ database which is housed on the organization’s server. The database contains archived information on completed projects as well as information on ongoing projects. These documents provide evidence of work done in order to

meet terms of payment. They also provide a reminder of the client's requirements, against which outcomes may be measured.

DevCo keeps copies of all project documents in a project database on their server. At the time of data collection, the organization's server was not online. Documents were stored and moved around on memory sticks. Information is also available on the organization's website. Although there was no intranet at the time of data collection, documents were shared by email and transferred on memory sticks. Project documents were referenced for reporting purposes and also consulted for training, participation in regional forums and in planning new projects and programs.

8. Visits to field operations

At TeleCo tours of project field were used to give new employees a first-hand introduction to the organization's operations. A supervisor explained that:

"TeleCo has a training program for new employees which involves mandatory visits to the project sites, to give the new hires an idea of the breadth of the organization's operation as well as provide a firsthand experience of what projects at TeleCo involve. Sometimes, the engineers have worked on similar projects at their previous workplace but the procedures followed were different. They are paired with a senior engineer who shows them how to complete the task in the TeleCo way. In cases where a new method proves more efficient than our way, it is brought back to the team for discussion. The modifications are communicated with all the team before we can adopt them as an alternative way to proceed when specific conditions present." (Participant # 11).

At DevCo, visits to field offices were conducted in the context of mid-term project reviews. Project managers from the head offices travelled to different field offices around the country based on their assigned thematic focus. Together, the officers reviewed and discussed project progress.

5.1.2 Learning Practices Unique to TeleCo

9. Co-location of project team members

Participants at TeleCo reported learning from each other when civil and electrical engineering teams were co-located on the same project sites. The physical proximity of team members encourages consultation across projects, sharing of experiences, and lessons learned. The management team at TeleCo considered co-location a self-preservation measure, opining that exposing technical employees to all aspects of the organization's operations helped to develop staff competencies in all aspects of the business and was more efficient than hiring and training extra people only to lay them off when business slowed down. One member of the management team explained that:

> *We want our people to be knowledgeable about all types of projects within our mandate, irrespective of their background training. A civil person should have an idea on basic electrical work although we would never ask them to be the lead or taken on the project on their own. If we achieve this, we can get more work done since everyone will be able to work on several aspects of different projects*. (Participant #6)

10. Asking questions of colleagues

Participants reported obtaining project information and learning about what transpires in projects by talking to and interacting with their colleagues. For example, when deployed on a field team, technicians at TeleCo called the head office to ask project managers for information on regulations, specific documents, clarification on project specifications or materials replenishments. One site supervisor explained that:

> *The common practice for exchanging project information is for people working on the same project to go to a colleague and directly ask questions when they encounter a problem. The question is answered immediately and if that colleagues does not know the answer, the person may be referred to another colleague*. (Participant #5)

11. Demonstrating Skills

Demonstrating skills was a popular method of exchanging project knowledge at TeleCo. Participants reported that since most of the work was hands-on, employees show others what to do through demonstration. The use of demonstration was confirmed by a participant who

explained that although every engineer had been given a manual on how to operate and run several pieces of equipment which the organization maintained at different project sites, many "had not turned a single page, but figured out how things worked based on what their colleagues showed them" (Participant #3). TeleCo's field sites were managed and supervised by civil works and electrical engineers, however, many tasks were handled by electricians, technicians, riggers and other laborers. It was common to find engineers explaining and demonstrating procedures to their field teams. Many respondents at TeleCo confirmed that "they learned by doing work."

At DevCo, demonstrating skills was not reported as a learning practice, instead, participants reported different training options when asked about learning on the job or from colleagues.

5.1.3 Learning Practices Unique to DevCo

12. Conducting project evaluation and review exercises

Interview data from DevCo revealed an elaborate program review and evaluation process. A member of the management team explained that "*DevCo has a continuous project evaluation process that includes quarterly, mid-term and end of year reviews*." The mid-term reviews are conducted in the field offices with the support of desk officers, while the end of project reviews are held twice a year at the head office. These final review exercises are attended by all desk and field officers (where possible) and are facilitated by an external consultant.

Participants at TeleCo did not report a formal project evaluation process. Rather, specific projects, based parameters such as on size of investment, importance of client to the organization or amount of resources committed (human hours) were chosen for appraisal. The goal was to ensure that these projects were financially viable. An individual project team member explained that:

> *We do not have formal project reviews. Project team members share stories and anecdotes about previous projects informally with their colleagues but we are not required to record this information or share it with others. When discussions about key projects are held, the meetings are closed, involving only the finance officer, responsible project manager and senior management. The rest of the project team is not privy to the details of these discussions*. (Participant # 14)

13. Membership in communities of practice and networks

Findings showed that DevCo had invested in building communities both within the organization and with other institutions. Participants reported participating in office visits where employees learned from one another. For example, field staff travelled to head office for bi-annual program review meetings where they shared experiences with their colleagues. Staff working at head office also travelled to the field offices to participate in quarterly reviews and collect project monitoring information. In addition members of the management team were in constant communication with DevCo's regional offices on common issues and with DevCo's global community on broader policy issues and matters of program evolution. One desk officer detailed the level of community engagement at DevCo:

> *At the national level, we regularly have forums where government departments and other organizations in the development sector meet to discuss issues of common concern, such as capacity building, resource coordination, dissemination of best practices or accreditation of NGOs - the forums discussed criteria that would be used to grade different NGOs based on levels of national penetration, number of services offered and tangible benefits to the communities. We also take part in sector working groups at the local and national level*. (Participant # 17)

Some networks are purely for information sharing, others help to pool resources to facilitate service delivery and yet, others help to enhance the organization's capacity in areas where they do not have enough resources. A member of the management team shared that DevCo had received an award for her efforts in advocacy and addressing the plight of women and youth by providing health services, basic education, and economic empowerment. The same member of the management team explained DevCo's partnering strategy:

> *We have built deliberate partnerships to help fill gaps in our expertise and skills since we cannot be experts at everything. For example, our partnership with local government enabled us to recruit volunteers to help with civic education and advocacy training where we were not in position to hire staff*. (Participant #15)

At TeleCo, respondents did not report using networks or communities as a main source of project knowledge. However, some project team members reported membership in different

networks such as professional associations and alumni networks where they obtained different kinds of knowledge, some of which could be relevant to ongoing projects.

5.2 Barriers to Project-Based Learning

Evidence from the study suggests three types of barriers, people-centered, organization-centered and type of knowledge. There was not enough evidence to confirm technology-centered barriers and barriers due to project characteristics.

5.2.1 People-Centered Barriers

1. Lack of time

Participants at TeleCo reported that lack of time to devote to learning from projects was a main challenge. An individual project team member explained that:

> *Our work schedule is driven by client demands and when we have our peak periods - which seem to be all the time. Since mobile phone penetration is always extending into the villages, there is no time in between projects to focus on learning. Our people are always running from one project to the next to catch up with the work load and make sure that everything is completed on schedule. As a project nears completion, the number of people assigned is gradually reduced and these people are re-assigned to new tasks. By project close out, you have the project manager and his site supervisor checking and verifying while most of the crew have already transferred to a new project site. Therefore anything that requires the entire team to be present has to be addressed at the beginning and during the implementation phases because everyone disperses at project end*. (Participant #8)

Participants at DevCo reported that time constraints arising from the nature of work and the way tasks were structured presented barriers to knowledge transfer across projects. Between reporting requirements, meeting with stakeholders and travel to field offices, staff were pressed for time to complete their project tasks. In addition, it was felt that learning reviews at the end of programs and at other scheduled times, took away from the employees' time to deliver on project tasks.

2. Lack of trust

Participants at TeleCo reported lack of trust between employees and management as a barrier to sharing project knowledge and learning. From the perspective of management, deployments to field sites were difficult to manage. A member of the management team explained that "accountability for time spent on task at different project sites was inconsistent. While some employees had logged many hours spent working on field sites, unannounced checks by project managers had revealed that not all employees were at the field site when they claimed to have been." Participant #6.

Some employees are believed to have inflated their time logs so as to get more pay, while others prolonged tasks to generate more billable time. A project manager described this practice as a "me first culture" (Participant #2). The situation with field deployments created tensions between management and project staff. Management responded to the situation by limiting field assignments to certain people and not to others. This only exacerbated the sentiments of privileged access to information as reported by some participants, and complaints that support departments such as finance and logistics were not included in decision making. Since knowledge sharing and transfer within the organization is based on who knows who and what they know, the breakdown in trust between management and project staff created a barrier to the transfer of project information among colleagues and across project teams.

Participants at DevCo did not explicitly report the lack of trust as a barrier to project-based learning. DevCo participants reported that they adhered to instructions in order to satisfy reporting requirements while the management team questioned their [employees] lack of questioning on tasks requirements. Where management perceived a need for improvement, an initiative was implemented to help staff achieve their objectives. However, staff commented that some new initiatives were not needed and only repeated previous ones but did not speak up or question their inception. The difference in communication styles between management and staff at DevCo resulted in delays in sharing project lessons.

3. Inequalities in Power and Status

Participants at TeleCo reported a tendency of some individuals to withhold certain information from teammates or stifle the progress of an initiative for fear of losing relevance. One supervisor shared his experience:

> *He said that when they implemented the materials template as part of streamlining the logistics process, it was difficult for people to use the template. The idea of the template is that at each stage, the person in charge fills out this form giving a brief description of the task and materials required. This is verified by the project manager and sent off to logistics where the order if filled and materials delivered to the project site. The requesting officer has to receive and verify materials at the site and it is their responsibility to follow-up if anything is missing from the initial request. When the task is completed, the same officer indicates materials used and returns the form to the project manager who compiles all project documentation. The problem was that some individuals in the logistics team did not want the requesting officer taking part in the order verification since they considered it their job and feared their duties would gradually be diminished. "We are still discussing the best way to implement the template and how it would help to standardize and improve the logistics process"* (Participant #13).

Participants at DevCo reported a lack of openness to ideas from some project offices. For example, when the project review committee sessions were held, project officers from different field offices met at headquarters to discuss and compare project progress against strategic goals. If a field office suggested ideas on improving processes, the group collectively discussed the ideas and agreed to adopt them as best practice. However, if officers from another office believed they had superior ideas or did not trust the expertise of the contributing officer, the suggested ideas were opposed, dragging out the process or causing the ideas to be dropped.

5.2.2 Organization-Centered Barriers

4. Organizational Culture

Participants at TeleCo reported that the hands-on way of working and the training by demonstration resulted in minimal documentation and high reliance on oral communication. Project team members prefer to ask or speak with a colleague as opposed to reading reports on a given project. Their job is hands-on and the learning is more effective in a "show and tell" format. Interview data showed that participants were keener on getting the job done than documenting their processes, which became a constant source of frustration for other

departments that needed to access these documents to support project work. One site supervisor explained that:

> *It is easier for me to show these people how to fix a generator than to use manuals. Here [in the field], they actually see how installations are done. Making notes about how to fix machines just takes up time which can be used to fix the next piece of equipment*. (Participant #11)

At DevCo, the organizational culture is formal. Employees are required to dress formally and conduct themselves in a professional manner. Documentation is one aspect of the work culture that is very noticeable. The organization produces several project and program related documents including newsletters, brochures, media spotlights, videos, etc. Participants at DevCo did not report culture-related learning barriers. However, some individuals intimated that there was a lack of informal spaces for sharing project/program related information and test out ideas before sharing them with all members of the project team.

5. Structure of work

Closely related to nature of work and culture of the organizational was the informal structure of project operations at TeleCo. On the one hand, the informal system contributed to knowledge sharing, and promoting collegiality. On the other hand however, some participants reported having few *formal* spaces for knowledge sharing and learning. Project team members were used to simply moving from one project to another without pausing to reflect. The idea of structuring the acquisition, retention, transfer and use of project knowledge seemed like more tasks added to their jobs.

The work structure at DevCo was more formal than that at TeleCo. The organization had more rules, guidelines and policies governing the generation, transfer and use of project information. The formal structure meant that there were less informal spaces for knowledge exchange among project team members. DevCo's nature of work, coupled with the need to account for donor funding created an extensive culture of documentation. To this end, all project information has to be written out and communicated with several people who are party to the particular project or program. While the emphasis on documentation promoted transparency, there is little room left to make mistakes or experiment with new ideas. Participants reported that

when everything was documented, people were hesitant to suggest ideas because if they failed, there would be a permanent record of their failed ideas. Yet, if they had "permission" to test it out with a few colleagues before presenting to the entire team, the idea would have been improved and had higher chance of success.

6. Inefficient organizational processes

Another barrier to project-based learning were inefficient processes at the organizational level (or the lack of such processes). For example, participants at TeleCo reported recurring problems with equipment shipments as a result of incomplete documentation both in placing orders for materials and in interpreting materials requests. According to one project manager:

> *We have so many problems with logistics. Sometimes twice the number of materials requested is delivered, other times, the materials are not enough and yet, at other times, the wrong materials are delivered to different sites. We have talked about this problem but it keeps coming back. We need to find a better solution to manage our logistics because so many hold-ups are the result of problems with logistics*. (Participant #9)

Another participant explained that sometimes the information recorded for a given project was not sufficient to draw inferences for application in subsequent projects. For example, the project checklist, a high level summary of project inputs and outputs that is created for clients does not provide information about situations in the field which would be helpful to other projects. According to one individual project team member:

> *A note explaining that a different thickness of pipe was used to lay electric wires at different project sites because of the difference in terrain and soil texture, and that the different pipes had nothing to do with technical requirements is not included in the checklist. This is information I wouldn't find in the project database but may learn from someone who worked on the project*. (Participant #14)

Additionally, a project manager reported that:

> *One of the problems we have with using information from past projects is that information in the project database is incomplete. Some project members do not do a good job in documenting to detail. So, when you find the documents in the project folder,*

> *it is difficult to understand the type of operation that was conducted and how action taken was justified in the original project. The information is not useful when there isn't enough detail to draw inferences from the context*. (Participant #7)

Furthermore, TeleCo did not have a formal system of evaluating completed projects or reflecting upon failed efforts. A few projects may be discussed by the finance manager and top executives based on the risk they pause to the organization's profitability. Where resolution cannot be achieved, the project is terminated. Other members of the project team are not privy to these discussions. One project manager explained:

> *We do not have formal project review sessions. Rather stories and anecdotes from past projects are shared informally among team members. Lessons learned are talked about but not documented as there is no requirement to do so. When projects are discussed, this only involves finance and senior management. The project managers may know what is happening with each project but there is no record of this information anywhere; it is all in the informal conversations. You have to know who to ask*. (Participant #14)

At DevCo, the complexity of the learning system and the effort required of staff to complete all reporting requirements was regarded as burdensome and taking up a lot of time. DevCo, being concerned with social change, is invested in long term processes. Accountability for donor funds creates a reporting obligation that permeates the entire culture of the organization. Everything has to be documented. As such there is a more developed reporting system at DevCo than TeleCo. However, this can be very time consuming. Participants reported a continuous evaluation and monitoring program including quarterly, mid-term and end of phase reviews as well as a bi-annual program review committee meetings attended by all major programs, units, and departments. All these reviews required the preparation of supporting documentation, an added layer to staff's main duties of performing program activities.

7. Insufficient funds

Participants at DevCo reported lack of funding as a main constraint to learning from projects. In particular, the lack of funds to acquire supporting technologies greatly compromised the organization's knowledge management and learning efforts. A desk officer explained that:

> *We have been able to support our field activities using donor funds, however, restrictions on the funds prevent us from using them to buy computers or pay for technical solutions since technology is not considered directly related to development goals. These restrictions have made our back-end operations very difficult. At the moment we have not been able to update our website and do not have a server. Project documents are kept in off-line databases and paper files*. (Participant #18)

In addition, DevCo's system of program evaluation and documentation required participation from many stakeholders and this was not always possible. Sometimes due to funding and logistical constraints, not all field staff were able to attend the biannual project review committee meetings. Also, staff training had to be scheduled on a rotating basis in consideration of funding available to support training programs and hire short-term replacements while staff attended training.

At TeleCo constraints on available funds has an effect on training provided for employees when equipment upgrades were required. For example, the cost of training all project team members on how to use new equipment is very high since TeleCo does not own telecommunications equipment but rather handles installations and maintenance on behalf of its clients. TeleCo relies on clients acquiring this new and sometimes customized equipment to pay for the training cost.

8. Lack of supporting technologies

Participants at DevCo reported that lack of access to supporting technologies, limiting the efficiency of knowledge transfer between projects and across the organization. Many documents were kept in print repositories, making it difficult to do research and retrieve lessons learned from previously completed projects and programs as there was no dedicated records management position. Participants also reported problems in accessing historical program documents. A desk officer commented that:

> *If you were looking for information about a project that closed 5 years ago, the number of boxes of files you would have to search through was discouraging. For older programs, many employees avoided consulting the paper files because the process was*

> *tiresome and time consuming. All this information could be easily accessible from the project database if the server was up and running*. (Participant #16)

5.2.3 Type of Knowledge

9. Explicit and tacit dimensions of knowledge

Due to the hands-on nature of project work at TeleCo, participants preferred to *show* their colleagues what they were working on or how something was done, rather than document the processes involved. This type demonstrable knowledge can be difficult to access on subsequent projects when parties involved do not recall the details or leave the organization and the knowledge has not been recorded.

In addition, participants at TeleCo reported using text messaging to communicate with colleagues at the head office when deployed to field sites. The problem with text messages is that they were not linked to or fed into the organization's knowledge base. Therefore conversations about projects conducted entirely via text messaging were lost if not deliberately transferred to the project database by parties to the conversation. The organization had no way of tracking project information exchanged using these technologies.

As explained earlier explicit knowledge is easily codified and transferred in contrast to tacit knowledge. The detailed system of documentation at DevCo contributed to explicating project-level knowledge and facilitated its sharing and transfer. Participants at DevCo did not report earning barriers in relation to knowledge type.

10. Lack of transferability of project knowledge - Uniqueness

Project characteristics such as the temporary nature, short-term goals, and unique tasks are cited as barriers to learning in the literature. At TeleCo, participants reported that projects were specific to each clients' requirements. Although some aspects were repeatable across projects such as conducting an environmental impact assessment when selecting a site to erect a mobile phone tower, the diversity in specifications meant that knowledge acquired on some projects was not relevant to others. In these instances, the project experiences remained anecdotes and were not called upon in subsequent situations.

At the time of data collection, DevCo was in transition from project-based operations to a program-based approach, due to the long-term nature of most projects. In the program context,

uniqueness was not a problem since the same program was ongoing, albeit with modifications based on periodic evaluations and reviews. Participants at DevCo did not report any learning barriers associated with typical project characteristics (e.g., short-term goals, temporary nature).

5.3 Summary of Results

The results presented above indicate that in this study;

The learning practices used across TeleCo and DevCo were grouped into twelve broad categories;

- Asking questions
- Teaching by showing
- Moving staff around the organization
- Co-locating project team members with different expertise
- Visiting field offices and project sites
- Participating in meetings
- Participating in training
- Conducting project review exercises
- Forming networks and communities of practice
- Using learning facilitators
- Preparing project documents
- Using knowledge repositories
- Maintaining relationships with stakeholders

The learning practices used involved self-initiated, informal, information seeking actions at the individual level as well as formal, organization driven collective efforts to capture and disseminate project knowledge. In addition, more of the learning practices used were common across TeleCo and DevCo than were unique to any of the organizations alone.

Of the five barriers to project-based learning discussed in the literature, the barriers encountered in this study were of three main types; people-centered, organization-centered and knowledge-type barriers. The most pressing barriers at either TeleCo or DevCo influenced the predominant learning practices reported at that organization.

This chapter has presented the results of the study. A more detailed summary and discussion of the results is presented in the next chapter.

CHAPTER 6: SUMMARY AND DISCUSSION

This final chapter of the dissertation restates the research problem and reviews the methods used in the study. The chapter then summarizes the results and discusses their implications.

6.1 Research Problem

Learning from project experiences is tempered by limited prospects for the diffusion of such knowledge from one project to other projects and across the wider organization (Ayas & Zeniuk, 2001). Researchers have found that too many project-based organizations are not learning adequately from their mistakes to exploit knowledge fully (e.g., Newell et al., 2006; Keegan & Turner, 2001). In addition, many of these organizations do not have a systematic approach for capturing prior learning, they do not expose apprentices to lessons learned, and hardly encourage practitioners to reflect on their own experiential learning (Pinto, 1999) such that there is little, if any learning within projects. Even where significant knowledge is generated within projects, there are often difficulties in capturing or translating this knowledge into new routines and practices at the level of the organization (Scarbrough et al., 2004). The inability to transfer lessons learned from one project to another often results in re-inventing the wheel, repeating mistakes, and less than optimal performance (e.g., Newell et al., 2006; Disterer, 2000; Schindler & Eppler, 2003; Prusak, 1999).

The purpose of this study was to develop a broad overview of project-based learning from the perspectives of project team members at two small organizations in Uganda. The study was specifically interested in the activities, behaviors and practices used by project team members to acquire, retain and transfer knowledge across projects and to other parts of the organization.

6.2 Review of Methodology

This research used a qualitative, multiple case study methodology to investigate how project team members at two organizations (one a profit based, telecommunications contractor - TeleCo and the other a development aid, non-governmental organization -DevCo) learned from their project experiences, as explained in Chapter 4. Attempting to discern the meaning of events

and activities from the perspective of study participants, the study investigated practices used to acquire, retain and transfer knowledge across projects over a six months period. Data was primarily collected through semi-structured interviews with 25 participants. Between April and June 2012, I interviewed participants at TeleCo on Mondays and Wednesdays and participants from DevCo on Tuesdays and Thursdays. Each interview lasted about 75 minutes and was recorded for transcription purposes. The interview data was complimented by document analysis, using publicly available project documents such as project reports and newsletters from DevCo and some proprietary documents from TeleCo such as strategic plans.

6.3 Summary of Results

A diverse number of learning practices was reported. Some of these learning practices were spontaneous information seeking behaviors and actions typical of any setting where people seek information to connect with peers, find their place within a group, or assimilate within a broader group. Participants reported individual actions such as "asking questions," "showing colleagues how to perform certain tasks," and "conversations with colleagues." These practices seemed more geared to socializing or orienting participants within project teams than to actual knowledge exchanges.

The learning practices also included organization driven actions, with the direct intention of acquiring, sharing and transferring project knowledge. For example, team meetings at DevCo followed an agenda, shared specific information, and achieved specific results. At TeleCo, training on new equipment was driven by changes in technology and participants were taught specific operations based on the needs and technology requirements of particular clients.

Results also showed that many of the learning practices used were common to both TeleCo and DevCo. Project team members at both organizations participated in training, meetings, maintained relationships with their clients and stakeholders, used learning facilitators, produced project reports and used knowledge repositories. None the less, some of the learning practices reported were unique to the respective organizations. TeleCo used teaching by showing while DevCo did not and DevCo had an elaborate system of project evaluation and review while TeleCo simply checked the financial viability of large (financial commitment) projects or important clients.

The literature review suggested that there are five types of barriers to project-based learning. Based on the results, the learning barriers reported across TeleCo and DevCo were mainly of three types; personal including lack of time, lack of trust, inequalities in power and status; organizational including organizational culture that does not support learning, inefficiencies in learning processes, insufficient funding, and inability to access supporting technologies; and type of knowledge including the difficulty in capturing and transferring tacit knowledge and limited transferability of unique project knowledge.

Based on the results, it would seem that the most pressing barriers at either TeleCo or DevCo determined the profile of learning practices adopted in that organization. Most learning practices reported at TeleCo such as co-location, skills demonstration, and relationships with stakeholders involved social interactions while DevCo seemed to balance social interactions with documentation with practices such as keeping diaries, conducting project review exercises and maintain networks and communities of practice.

6.4 Discussion of Results

Learning practices

As presented in Chapter 5, this study identified 12 broad categories of learning practices used across TeleCo and DevCo. The categories vary according to the different project phases in which they occur, as well as the type of knowledge process they represent (Brady et al., 2002). The conceptual framework (Chapter 3) introduced three knowledge processes at the core of project-based learning; experience accumulation, knowledge articulation, and knowledge codification. Zollo & Winter (2002) explain that while formal experience accumulation can facilitate learning, this will typically not be as effective as the more systematic approaches to capability enhancement through higher processes of knowledge articulation and knowledge codification. In the following sections, the learning practices reported in this study were interpreted in the context of these three knowledge processes, as illustrated in Table 8.

Table 8. Learning Practices Arranged by Knowledge Processes

Experience Accumulation	Knowledge Articulation	Knowledge Codification
• Asking questions • Demonstrating skills • Co-location of project team members • Moving staff around the organization	• Participating in training • Participating in meetings • Memberships in communities of practice and networks • Conducting project reviews • Maintaining relationships with stakeholders • Using learning facilitators • Visiting field operations	• Preparing project documents • Using knowledge repositories

6.4.1.1 Experience Accumulation

Experience is what transpires in the organization as it performs its tasks (Argote & Miron-Spektor, 2011). As discussed in Chapter 2, experience may be acquired from a cumulative number of task performances and repetition. Experience-based learning tends to be local, i.e. closely related to existing routines. In relation to enhancing project based learning, experience accumulation refers to the reliance on individuals moving from project to project, taking their accumulated experience with them (Senge, 1990). Thus, if an individual was involved in a project, where learning from a previous project was relevant, they could then use this knowledge in the context of the new project. Strategically using accumulated experience so that people are assigned to projects where their previous experience is going to be applicable would mean that there may be more efficient team learning and knowledge transfer on those projects, because the individuals involved have been assigned based on their experience in solving problems that are likely to be faced (Cohen & Levinthal, 1990).

Demonstrating Skills

In this study, demonstrations at TeleCo involved showing others and explaining to project team members how different parts of equipment were fitted together to erect mobile phone towers and working alongside them to actually perform the task. Other demonstrations involved laying fiber optic cables or inspecting filed sites and performing maintenance operations on the equipment previously installed.

Learning from demonstration, is also known as imitation learning and teaching by showing. At TeleCo, demonstration was an important way of sharing project knowledge while participants at DevCo did not report skill demonstration as a learning practices. Artificial intelligence research has shown that when humans learn novel motor skills, they often do so through teaching by showing (Kawato et al., 1994). People watch professional athletes, sisters, brothers or their parents who demonstrate new motor behaviors. They perceive these movement patterns, extract essential features, and try to perform the movements by themselves

Moving staff around the organization

Staff assignments at DevCo involved transferring project team to different offices within the DevCo family for periods of secondment while TeleCo moved experienced team members to new projects and co-located senior project team members with their less-experienced counterparts. Moving employees from one organizational unit to another is a mechanisms for transferring knowledge (Kane et al., 2005). When members are moved from one organizational unit to another, they are able to transfer tacit as well as explicit knowledge, and subtle understanding to the new unit (Berry & Broadbent, 1984; 1987). Further, members are capable of adapting knowledge to the new context (Allen, 1977).

Proponents of learning by transferring project team members, as knowledge carriers, believe that learning across projects occurs when individuals come together under circumstances that encourage them to share their ideas and (hopefully) to develop new insights together that will lead to the creation of new knowledge (Sanchez, 2004).

6.4.1.2 Knowledge Articulation

Knowledge articulation involves individuals engaging in collective reflection to gain insight (Edmonson, 2002). There are three properties of knowledge articulation: it eases diffusion and replication within and between organizations, it is conducive to complex problem-solving and, it involves the creation of new knowledge (Tell, 2014). For example, the requirement for teams to engage in deliberate project reviews and reflection sessions in order to develop a collective understanding of what works is a knowledge articulation process that should aid in enhancing dynamic project-working capability (Newell & Edelman, 2008).

Conducting project reviews

Post project reviews are widely regarded as standard best practice for collecting project knowledge for re-use in future projects. DevCo had an elaborate system of reviewing project work on a quarterly basis. In addition, they held bi-annual end of project reviews to discuss successes and identify lessons learned to be carried into new program phases. In this sense, knowledge articulation can be thought of as a process of perspective-making (Boland & Tenkasi, 1995). Perspective-making refers to the processes involved in strengthening the unique knowledge of a particular community of knowing. The project team then, in its project review is engaged in perspective-making, with the review encouraging project team members to develop their knowledge and practice about successful solutions and those that are not successful. Knowledge articulation practices such as project reviews allow the team to make sense of their own actions and outcomes and in doing so enhance team learning. After learning has been articulated as a collective, it is easier for individual team members to share with colleagues and in turn transfer the learning to subsequent projects.

On the other hand, project team members at TeleCo did not have a systematic way of collecting feedback was a project was completed. Some project team members informally talked about their project experiences or shared anecdotes with colleagues but a formal review was not conducted and there was no documentation recorded from any reflective process. Some projects, based on monetary value or importance of the client to the organization were discussed by top management, if there was a problem with the financing or threats to completion deadlines.

Participating in meetings

In this study, meetings were a common feature at both organizations, although more used at DevCo than at TeleCo. At TeleCo, meetings were held at the beginning of any new project to discuss expectations and plan of action. Follow up meetings were ad hoc, based on the needs of the project. There were no formalized meetings at the organization-wide level as any number of staff may have been deployed to a field site. On the other hand, project team members at DevCo were involved in many meetings. At the head office, a weekly organization-wide meeting was held, attended by all members of different project and program teams working at the head office. Then, each project and program team had quarterly meetings where members discussed progress and made any adjustments as necessary. At an organization-wide level, the program review committee (PRC) meeting was convened twice a year to review overall progress of the organization. The PRC was attended by all head office project and program staff together with project officers responsible for and based in the field offices. The wide use of meetings is supported by literature on the social nature of learning and popularity of collaborative learning practices.

In their study, Paulus and Yang (2000) found that brainstorming groups created more novel ideas per person than individuals working alone. Their findings depart from the prevailing view that groups who use brainstorming techniques generate fewer unique ideas per person than individuals working alone (see Mullen, Johnson & Salas, 1991, for a review) and suggests that group interactions can enhance creativity. Paulus and Yang (2000) also found that procedures for interaction that exposed group members to the ideas of others while allowing them to generate ideas continuously and maintain their own identity led to the creation of more novel ideas than procedures that simply pooled the ideas of group members. Thus, when structured appropriately, group interactions can have synergistic effects on group performance and can lead to the creation of new knowledge and learning.

Participating in training

Formal training involves workshops, seminars and courses held in a traditional classroom setting. The training maybe delivered on the organization's premises or offsite at a university or other schedule venue. In this study, formal training at TeleCo was the responsibility of the client and this involved workshops on health and safety and updating project team members on new

technology. Since the organization did not have capacity to acquire the technology and conduct the training itself, the client, who engaged the organization to install or maintain a particular piece of equipment was responsible for training when there were changes in technology. Because the changes in technology take a while to materialize in equipment upgrades, the formal training sessions at TeleCo were few and far in between.

At DevCo, the organization was highly involved in training. Every quarter, employees were sent to attend training sessions with either regional partners, local government or at universities both locally and in other countries. The training at DevCo focused on skill development, for example in the area of advocacy which was a new theme to the organization. Other courses that employees attended included; project management courses, the new national NGO policy, community health and entrepreneurship training. Many of the training courses were of the train-the trainer variety so the project officers could in turn train the local communities where the projects were being implemented.

Memberships in communities of practice and networks

Partnerships were extensively used at DevCo to build communities of practice with local government agencies and other non-governmental organizations operating in the development sector. DevCo used these communities to gain expertise in areas where their capacity was lacking, to acquire knowledge and learn from the experiences of partners, to benchmark performance against that of other partners and contribute to policy reform by participating in collective fora on issues of common concern.

Communities of practice are a well-known example of knowledge sharing through participation (Wenger, 2000). Huysman (2002) has argued that communities of practice are the social unit best suited to support organizational learning and managing knowledge sharing within organizations by externalizing, objectifying and internalizing knowledge. This is because communities are better able to support the internalization of knowledge by offering apprenticeship through legitimate peripheral participation (Lave & Wenger, 1991). Communities are also best suited to support externalizing knowledge by enabling learning from and within each other (Hemmecke & Stary, 2004). The results of a contextualized externalization process enables stakeholders with different backgrounds to share knowledge that was previously tacit. And, communities are best suited to objectifying knowledge by supporting the transformation of

shared knowledge into collectively accepted knowledge. Objectification refers to the process through which shared knowledge becomes accepted by the collective as being reliable, valuable and useful to use when acting as a participant of the organization (Huysman, 2002).

Furthermore, previous studies have found that characteristics of the social network among members (or units) affect knowledge transfer. Early research on social networks compared the effects of various communication channels (e.g., a *wheel* in which all communication went through a central hub versus an *all-channel* network in which all members could communicate with one another) on information sharing and performance in groups (Guetzkow & Simon, 1955; Leavitt, 1951). Although the wheel network was initially shown to be the best communication structure, this effect was subsequently shown to depend on the uncertainty of the task. For routine tasks, centralized structures such as the wheel were associated with the greatest performance, whereas for non-routine or uncertain tasks, decentralized structures such as the all-channel network, were associated with the highest performance (Heise & Miller, 1951; Macy, Christie, & Luce, 1953; Shaw, 1954, 1964).

The results of this study showed that for TeleCo, the all channel network was appropriate as requirements specifications varied from one project to the next. The project team used many provisional mechanisms depending on the needs of a given project sites. For example some project sites that were located in the country side necessitated the project manager and site supervisor to make a judgement call on whether to deploy staff from the head office to complete the project faster or to hire local technicians and training them. The former route would take the initial site build project longer to complete but would save time and money in the long term as local hires would be closer to the site for maintenance services, while the organization would have to incur the costs of transporting a team of head office staff to and from the site

Using Learning Facilitators

Other studies have found that having positions that bridge structural holes (Burt, 1992) is an effective mechanism for importing knowledge from other organizational units (McEvily & Zaheer, 1999). For example, Allen (1977) found that having a "gatekeeper" at the boundary of a group who could communicate with internal and external constituencies improved the performance of applied research groups because these gatekeepers facilitated knowledge transfer.

Participants at both organizations in this study reported what would be equivalent to a learning mediation role, although not referred to as such. At TeleCo, the project coordinator role performed the function of liaising between the project team on the one side and the client on the other side. In addition, the project coordinator was knowledgeable about concurrent ongoing projects and had a panoramic view of the organization's activities. She was well placed to suggest opportunities for exchange among different project teams. The project coordinator managed the flow of project knowledge among different parties in the organization and between the organization and its stakeholders. At DevCo, there seemed to be two positions that complement each other. The programs manger has a *bird's eye view* of all projects and programs. This position is responsible for overall coordination and ensuring that information and knowledge flow smoothing across programs and the wider organization. In addition, DevCo engages consultants to facilitate project and program reviews in the project close out phase. The consultants lead the reflective exercise on past performance, helping project team members to identify lessons learned and articulate possible solution paths.

Managing Stakeholder Relationships

In this study, TeleCo was keen on collecting and acting upon customer feedback. Unsolicited feedback was mostly informal and delivered directly to the project manager, unless the client was very unhappy and addressed their complaint to the management team. TeleCo also proactively provided status updates on ongoing projects and asked customers directly to provide feedback on the organization's services. The customer's positive opinion was a highly considered indicator of the project and organization's performance.

At DevCo, customer feedback was recorded in form of beneficiary testimonials in annual reports and activity reports. As well, feedback may be received from the public, government and local officials in form of compliments for services provided to the community, for example in cases of disaster response. Given the nature of work that DevCo is involved with, customer feedback may not necessarily be a good indicator of performance. For the poor communities that receive the services of basic education, nutrition and health assistance, there is always a word of gratitude but that doesn't imply it is always well done. A more robust indicator of performance for DevCo would be to benchmark results against sister agencies and other organizations

operating in the same industry and determine improvements in the quality of life of the recipients.

Awuah (2006) argues that an organization's ability to understand and satisfy customers' needs and wants is now considered a key competence to improve sustainable competitive advantage. Customer feedback can be active or solicited such as through feedback surveys which can be tied to employee performance evaluation and used to benchmark performance (Wirtz & Tomlin, 2000). Or, feedback can be passive and unsolicited such as through complaints, compliments and suggestions. Organizations are interested in these responses as a way to ensure that they remain relevant to their customers. Feedback also helps organizations to protect their reputation by making improvements when customers are not happy, instead of going to the competition.

6.4.1.3 Knowledge Codification

Codification allows for the creation of a permanent record which extends the life of knowledge and facilitates its manipulation and dissemination across time and space. Further, codification contributes to the development of memory, which is argued to be the basis of learning. Newell and Edelman (2008) hypothesize that codifying lessons learned enhances knowledge transfer and learning across projects. The authors suggest that the actual activity of creating a document to capture learning may further enhance perspective-making within the project team as well as the availability for other teams to learn from, through a process pf perspective-taking (Boland & Tenkasi, 1995) that reaches well beyond the potential of individual networking. However, perspective-taking can only occur if the knowledge of others has been represented in some form and made available to others, for example in the form of boundary objects (Ciacciatori, 2008; Carlile, 2002; Start 1989). Boundary objects are defined as:

> Objects which both inhabit several intersecting social worlds… and satisfy the informational requirements of each of them. Boundary objects are objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across the sites… The creation and management of boundary objects is therefore a key process in developing and maintaining coherence across intersecting social worlds (Star & Griesemer, 1989, p. 393)

Serving as boundary objects, documented lessons learned, potentially provide this knowledge representation that will enable other project teams to engage in a perspective-taking process, as long as others actually identify and attempt to make sense of this prior learning.

Preparing Project Documents and Reports

At DevCo, there was an emphasis on documenting project activities and accounting for project expenditure. A significant amount of project knowledge was recorded in different documents such as activity reports, annual reports, donor reports, projects newsletter, project webpages, financial statements, strategic reports, policy documents, program review reports, and others. These documents were kept in both paper and electronic files. Documents prepared by different roles within the organization collected different types of knowledge, together providing multiple perspectives of the organization's work in the community. For example, the field officers had direct contact with the communities and recorded vast amounts of information about these stakeholders which the desk officer did not have. In turn, the programs manager had a bird's eye view of all the projects and programs of the organization, a perspective that individual field officers did not have. At TeleCo, documenting was minimal and centered on preparing progress reports to keep the clients informed of project activities as well as provide explanation in case there was any change in plans or divergences from the customer's initial project specifications.

Argote (1999) argues that knowledge embedded in tools and artifacts is less likely to decay than knowledge embedded in softer repositories, such as people. For example, less knowledge depreciation has been found in firms where most of the knowledge is embedded in technology, such as automobile assembly plants, than in firms that are less technologically sophisticated, such as fast food franchises. Learning through documenting operates on the premise that preparation of these documents generates codified knowledge which facilitates easy transfer replication in different situations.

Using Knowledge Repositories

Repositories store knowledge about a topic in a concise and organized manner (Ruikar et al., 2003) for fast retrieval and reuse. The information stored has usually been validated by and is available to all employees. It is typically reusable such as frequently asked questions, how-to guides, simple forms, templates, lessons learned and best practices. In the case of best practices, the details captured may include where the idea originated, a brief description of the practice, the savings it achieved and the name of a contact from whom more information can be obtained (Dixon, 2000). These knowledge bases are often technology-based with the information stored in electronic databases and they use search engines to find and retrieve information when needed. Some knowledge bases however, may be paper-based, with project information stored in binders and file cabinets. Information in the knowledge base may be gathered voluntarily by encouraging project team members to submit lessons learned from a project using simple templates and worksheets. This information may also be sourced from formal sessions specifically conducted for the purpose of eliciting and capturing project lessons.

In this study, evidence of embedded knowledge was found in almost all of the six bins proposed by Walsh and Ungson (1991). At TeleCo for example, results showed that a significant amount of knowledge, at the managerial level, was embedded in individuals while for the rest of the organization, knowledge was evenly embedded in different bins, except for the organization's physical setting. All the project documentation and reports are stored in the project database, housed on the organization's server. The project database is constantly consulted to reference these documents. Processes and procedures, such as the logistics process at TeleCo contain embedded knowledge in the information collected from materials orders. When linked back to projects, a snap shot of the organization's operations can be gleaned. Knowledge is also embedded in roles, for example the project manager role at TeleCo has been deliberately tasked with customer follow-up creating strong relationships between clients (their contacts) and TeleCo's project managers. Additionally, because most of the project team members at TeleCo share a common technical background, the problem solving culture involves hurdling and brainstorming informally. The project team members easily talk to one another over writing or recording setbacks.

Applying the Conceptual Framework: Learning Landscapes

The interpretive value of the knowledge processes introduced in the conceptual framework was empirically tested on qualitative data collected from a field study of six firms (Prencipe & Tell, 2001; Brady et al., 2002). Data was analyzed at the individual, group and organizational levels against each of the knowledge processes of experience accumulation, knowledge articulation and knowledge codification to develop what the authors termed as an organization's *learning landscape*. According to Prencipe and Tell (2001), an organization's learning landscape is "the mix of project-based learning practices[3] adopted and implemented" (p. 1380). The concept of a learning landscape extends and enriches Hansen et al. (1999)'s dichotomy of personalization and codification strategies for knowledge management, defined by a continuum whose extreme poles are tacit and explicit knowledge. The learning landscape takes into account the multidimensional character of an organization's approach to project-based learning, accommodating both cognitive and community based learning practices. Prencipe and Tell (2001), and later Brady et al. (2002) identified three main types of learning landscapes; the explorer or L-shaped landscape, the navigator or T-shaped landscape, and the exploiter or staircase landscape. The results from this study were interpreted in the context of these three landscapes.

The Explorer Landscape

According to Prencipe and Tell (2001), firms that rely to a great extent on people-embedded knowledge are characterized by L-shaped or explorer landscapes. These firms emphasize experience accumulation processes and knowledge transfer through people-to-people communication, and are characterized by a strong and receptive culture. The authors classify these firms as explorers, since their relatively small size in combination with the features of their corporate culture were found to constitute a strong enabling springboard from which to explore different routes to adopt and implement project-to-project learning practices based on knowledge articulation and codification processes. Table 9 shows an ideal L-shaped landscape.

[3] Learning mechanisms are empirical instances such as lessons learned databases, meetings or informal encounters. The learning landscape then refers to the collection or portfolio of such mechanisms.

Table 9. Ideal L-shaped landscape

Level of analysis	Learning processes		
	Experience accumulation	Knowledge articulation	Knowledge codification
Individual	• On the job learning • Job rotation • Specialization • Re-use of experts	• Figurative thinking • Thinking aloud • Scribbling notes	• Diary • Reporting system • Individual system design
Group/project	• Developed groupthink • Person-to-person communication • Informal encounters • Imitation	• Brainstorming • Formal project reviews • De-briefing meetings • Ad-hoc meetings • Lessons learned or post-mortem meetings • Intra-project correspondence	• Project plan/audit • Milestones/deadlines • Meeting minutes • Case writing • Project history files • Intra-project lessons learnt database
Organizational	• Informal organizational routines, rules and selection processes • Departmentalisation and specialisation • Communities of practice	• Project manager camps • Knowledge retreats • Professional networks • Knowledge facilitators and managers • Inter-project correspondence • Inter-project meetings	• Drawings • Process maps • Project management process • Lessons learned database

Source: Prencipe & Tell, 2001

Based on empirical findings of the present study, the organization that best matches an explorer landscape is TeleCo. As described in Section 4.1, TeleCo is a small telecommunications contracting organization. It is characterized by an informal, people-based culture. The organization does not have a formal learning system and relies to a great extent on personal and informal contacts for knowledge transfer and staffing purposes. Project team members acquire information by directly asking questions of their colleagues and in turn share information by demonstrating how things work. Meetings are ad hoc, if held at all, and there are no formal project reviews except for checks on the financial performance of select projects depending on their size, dollar worth and relationship with the client. The project managers interviewed reported that the lack of formal tools inhibited re-use of project knowledge, especially where

knowledge is not embedded in products or technical drawings. Table 10 highlights explorer landscape characteristics found at TeleCo.

Table 10. Explorer landscape for TeleCo

Level of analysis	Learning processes		
	Experience accumulation	Knowledge articulation	Knowledge codification
Individual	• On the job learning • Job rotation • Specialization • Re-use of experts	• Figurative thinking • Thinking aloud • Scribbling notes	• Diary • Reporting system • Individual system design
Group/project	• Developed groupthink • Person-to-person communication • Informal encounters • Imitation	• Brainstorming • Formal project reviews • De-briefing meetings • Ad-hoc meetings • Lessons learned or post-mortem meetings • Intra-project correspondence	• Project plan/audit • Milestones/deadlines • Meeting minutes • Case writing • Project history files • Intra-project lessons learnt database
Organizational	• Informal organizational routines, rules and selection processes • Departmentalisation and specialisation • Communities of practice	• Project manager camps • Knowledge retreats • Professional networks • Knowledge facilitators and managers • Inter-project correspondence • Inter-project meetings	• Drawings • Process maps • Project management process • Lessons learned database

* The shaded practices were identified in empirical results from TeleCo in this study.
Adapted from Prencipe & Tell, 2001

When matched with the description of empirical cases studied, TeleCo's approach to project-based learning may be viewed as an explorer landscape. Nonetheless, the mapping of the learning practices identified at TeleCo does not conform to an "L" shape as indicated in Prencipe and Tell (2001)'s diagrams. This may be due to several reasons, First, that the practices used in Prencipe and Tell (2001)'s study were collected from firms developing complex product systems and operating in the software, aerospace, defense, flight simulation and power generation sectors

explains why an "L" shape was derived. To recognize the diversity of learning practices (Brady et al., 2002) possible in a process based approach to managing project knowledge and learning requires that researchers and practitioners are open to different shapes of landscapes. The common point of departure and biggest contribution of the learning landscape is in identifying a similar set of circumstances across different organizations that characterize the status of learning in a given setting; in other words, it is like common symptoms in patients suffering from malaria. The basic drugs are known although the course of treatment for each patient varies according to their general health and other factors in their environment. What is important is the right diagnosis of the disease.

Second, Prencipe and Tell in their 2001 study used a bigger sample than the present study. The matrix is generated from a wider variety of learning practices. It is also important to note that Prencipe and Tell's (2001) work is about knowledge codification. The authors look at "cognitive and social practices involved in knowledge codification" (p. 1376). While the practices identified may serve multiple functions, the present study is interested in the complete learning cycle, involving processes of acquiring, capturing, sharing, transferring and applying lessons learned from project experiences to support project-based learning. A lesson is not learned until it is returned to practice (Milton, 2010).

The Navigator Landscape

This landscape characterizes firms that implement practices for project-to-project learning based on a knowledge articulation process. Their focus is on the implementation and appreciation of these practices not only at the individual and project levels but also, and mainly, at the organizational level, using a T-shaped landscape. These firms navigate through a few evolving routes to improve their project-to-project learning that may become established at some point. Table 11 shows an ideal T-shaped landscape.

Table 11. Ideal T-shaped landscape

Level of analysis	Learning processes		
	Experience accumulation	Knowledge articulation	Knowledge codification
Individual	• On the job learning • Job rotation • Specialization • Re-use of experts	• Figurative thinking • Thinking aloud • Scribbling notes	• Diary • Reporting system • Individual system design
Group/project	• Developed groupthink • Person-to-person communication • Informal encounters • Imitation	• Brainstorming • Formal project reviews • De-briefing meetings • Ad-hoc meetings • Lessons learned or post-mortem meetings • Intra-project correspondence	• Project plan/audit • Milestones/deadlines • Meeting minutes • Case writing • Project history files • Intra-project lessons learned database
Organizational	• Informal organizational routines, rules and selection processes • Departmentalisation and specialisation • Communities of practice	• Project manager camps • Knowledge retreats • Professional networks • Learning facilitators • Knowledge managers • Inter-project correspondence • Inter-project meetings	• Drawings • Process maps • Project management process • Lessons learned database

Source: Prencipe & Tell, 2001

Based on empirical findings of the present study, the organization that best matches a navigator landscape is DevCo. As described in Section 4.2, DevCo is a small, non-governmental, development aid organization. At the time of data collection DevCo was in transition from a project-based (short-term) to a program-based approach (long-term) to its operations. The organization has an extensive system of project documentation as required to account for donor funds. There are ongoing project and program reviews in addition to a bi-annual program review convention of all program staff. The organization is structured around project activities and only maintains a skeletal support staff. Program officers are expected to record lessons learned on their project reports, end of project/program reviews are facilitated by consultants and employees have access to several training opportunities. There is an internal email policy to streamline project communication and program staff have diaries to record learning during project

implementation. Staff participate in regular team meetings, group meetings and regional and sector meetings and still talk to one another informally. Table 12 shows navigator landscape characteristics found at DevCo.

Table 12. Navigator Landscape for DevCo

Level of analysis	Learning processes		
	Experience accumulation	Knowledge articulation	Knowledge codification
Individual	• On the job learning • Job rotation • Specialization • Re-use of experts	• Figurative thinking • Thinking aloud • Scribbling notes	• Diary • Reporting system • Individual system design
Group/project	• Developed groupthink • Person-to-person communication • Informal encounters • Imitation	• Brainstorming • Formal project reviews • De-briefing meetings • Ad-hoc meetings • Lessons learned or post-mortem meetings • Intra-project correspondence	• Project plan/audit • Milestones/deadlines • Meeting minutes • Case writing • Project history files • Intra-project lessons learned data base
Organizational	• Informal organizational routines, rules and selection processes • Departmentalisation and specialisation • Communities of practice	• Project manager camps • Knowledge retreats • Professional networks • Learning facilitators • Knowledge managers • Inter-project correspondence • Inter-project meetings	• Drawings • Process maps • Project management process • Lessons learned database

* The shaded practices were identified in empirical results from DevCo in this study.
Adapted from: Prencipe & Tell, 2001

The Staircase Landscape

Prencipe and Tell (2001) proposed a third landscape, the staircase or exploiter landscape. This landscape characterizes firms already involved in the advanced development of ICT-based tools to support their project-to-project learning. Their emphasis is on deliberate attempts to codify and store knowledge developed during the execution of a project and document it so that it becomes more easily accessible and exploitable for the rest of the organization's members.

These firms are involved in the advanced development of ICT-based tools to transfer and exploit project knowledge. None of the organization studied matched this landscape.

Summary

Based on the landscapes interpretation, the results show that TeleCo did not have many practices facilitating knowledge articulation and that knowledge codification was only client based without focus on internal learning. The nature of project work is oriented towards achieving pre-set goals in a limited amount of time. As such, all efforts are directed towards this end and employees are rewarded for meeting project goals. The argument for project-based learning on the other hand assumes long-term objectives involving identification of project lessons to learn, retaining, and disseminating them to improve future performance. These learning objectives are not consistent with the project-based organization's goal of completing projects within a limited time. The focus therefore is on execution to produce good results now other than on learning to improve future results.

The results also show that for DevCo, there is a purposeful approach to project-based learning, however, the staff did not ask for reasons why things were done in a certain way. Procedures were not questioned and as such some of the activity reports produced remained a record of events and not products of reflection about why certain decisions were taken. This lack of questioning can be a problem in learning as the information only flows one way. There is no deliberation and the opinion of the staff is not voiced, therefore any new ideas or suggestions for improvements are lost as the employees self-censor and do not feel empowered to participate in the discussion.

The lack of participation in some activities could also be a function of the culture in the organization and the existence of several levels of separation between employees in the organization. There may be conceptual separation between technical and non-technical employees requiring specific roles to broker conversation between the two groups. For example the operations team at TeleCo had to find simple language, without technical jargon, to communicate project details with support staff in the finance and logistics offices. Separations may also be caused by lack of trust among employees based on previous experiences. All of these factors interfere with the distribution of knowledge between projects.

Staff at both organizations gained experience through formal education and once hired, through interactions with colleagues and peers on the job and by performing their assigned tasks/roles. The components of experience accumulation seem to be the building blocks of the learning process. Both organizations have task routines through which employee capabilities are enhanced. In addition, TeleCo seemed to rely entirely on informal, apprentice-like practices to transfer project knowledge while DevCo predominantly used documentation to share and transfer project knowledge.

Barriers to Project-Based Learning

Barriers to organizational learning are seen as those systems and behaviors that prevent or inhibit organizations from adapting to the main decision-making challenges that they face (Fischbacher-Smith & Fischbacher-Smith, 2009). These barriers may arise from the processes of identifying and adopting new behaviors and practices in light of successes and failures. They occur at multiple levels within and between organizations, and involve both individual and group processes and behaviors.

As presented in Chapter 5, the barriers to project-based learning reported in the study were of three main types; personal, organizational and knowledge type. The results did not provide enough evidence for technology-centered barriers. For example, the lack of computers and inability to update the organization's website at DevCo were a result of a lack of funds to access technology and associated services rather than a technological problem. Furthermore, barriers related to project characteristics seemed to manifest as organizational characteristics, with respect to the two project-based organizations studied.

People-Centered Barriers

Lack of time

Learning across projects requires time investment in reflecting upon the current state of affairs to identify learning gaps and pursue the necessary steps to close these gaps. When the pace of work is fast and project teams are focused on delivering against tight deadlines, for example at TeleCo, there is no time for reflective exercises and as such opportunities to share project knowledge are missed. Keegan and Turner (2001) argue that without adequate time for reflection on the outcomes of actions (what happened, how, why and what might be improved),

or adequate attention to feedback and alignment mechanisms within project teams, the lessons emerging from the collective actions of project teams are easily lost.

Lack of trust

Lack of trust impedes project-based learning. Results from TeleCo showed lack of trust between staff and management as a result of field staff's failure to account for time spent on task. These actions had a direct impact on experience accumulation in terms of influencing how staff were assigned to different project teams. In addition, when delinquencies were discussed at meetings, reports from the projects in question were not taken seriously when shared with other project teams because they did not trust the information presented. In other cases, opportunities to share knowledge and learn from projects may be thwarted if the work environment does not allow room for failure. For example at DevCo, the new email policy requiring multiple parties to be copied in all project-related emails would discourage learning intended questions to colleagues if the authors did not want to address such questioning emails to the entire project team. At the same time, the knowledge owners may feel more comfortable explaining something to an individual than responding to a group email. These findings are consistent with previous research on the relationship between trust and knowledge transfer in organizations.

It is generally accepted that trust is a prerequisite for knowledge transfer (Nonaka, 1991; Adler, 2002; McAllister, 1995). De Long and Fahey (2000) argue that low-trust cultures constrict knowledge flows in organizations. "The level of trust that exists between the organization, its subunits, and its employees greatly influences the amount of knowledge that flows both between individuals and from individuals into the firm's databases, best practice archives, and other records" (p. 119). The lack of trust has also been identified as a significant barrier to knowledge management (Hendricks, 1999). In his doctoral dissertation, Evans (2012) examined trust as interpersonal relationships and transactions (Worchel, 1979). Specifically, he studied the "contextual factors that serve to either enhance or inhibit the development and maintenance of trust" (Lewicki & Bunker, 1996, p. 116). Based on an extensive review of the literature, Evans (2012) found that the majority of research examining the impact of trust on knowledge sharing builds upon previous work in the fields of psychology and behavioral science that examine trust as an antecedent for social behavior. The consensus of this research seems to suggest that higher

trust among individuals leads to higher and more productive knowledge sharing behaviors and activities between them.

Inequalities in power or status

Power/status issues played out differently at each organization. At DevCo, the topic was subtle, expressed as a perceived difference in communication styles – the program team claimed to be following instructions while management mentioned the lack of critical thinking skills. In the end, the issue was a lack of consensus on how to proceed with a new policy that imposed monitoring of project-related emails. Although subtle, these tensions may have limited what people chose to document, leaving out the mistakes, and yet this is where lessons learned could be most helpful. At TeleCo, the engineers felt closer to project work than other departments and did not always follow standard procedures or record the deviations they made. This led to misuse of company resources by field staff. In addition, group meetings were not effectively used nor collective reflection limiting the effectiveness of articulation practices. These results agree with previous research that power dynamics within the operational context affect the way knowledge is perceived and used.

Davenport et al. (1998) argue that knowledge is "intimately and inextricably bound with people's egos and occupations" and does not flow easily across the organization (p. 45). According to Stenmark (2001), people are not likely to share knowledge without strong personal motivation. Motivational factors that influence knowledge sharing between individuals can be divided into internal and external factors. Internal factors include the perceived power attached to the knowledge and the reciprocity that results from sharing. Status differences impede cross-functional knowledge sharing. "A culture that clearly values some units over others is more likely to undermine the cross-functional transfer of any type of knowledge, in part by supporting subcultures that seek to defend their own knowledge assets" (De Long & Fahey, 2000, p. 120).

Organization-Centered Barriers

Organizational Culture

Results showed that in the way people worked at TeleCo, there was reluctance to document work processes since project team members believed that completing project tasks was a more efficient use of their time than writing how-to notes. These finding as are consistent with

previous research and may be explained by the argument that since the project teams at TeleCo predominantly include engineers, there is a professional-subculture within the operations department where project team members assume that a quick verbal explanation of technical specifications is enough to communicate project information. This may impede information flow beyond the operations department where other employees who do not share the common language of engineers cannot interpret the information in technical specifications to understand what is happening in the project. Other project teams that are not familiar with the specific circumstances of a given project do not have access to this information if it is not captured in some tangible and transferable form.

De Long and Fahey (2000)'s work conceptualized four important relationships between culture and knowledge. First, culture and subcultures shape assumptions about what knowledge is and which knowledge is worth managing. Second, culture defines the relationships between individual and organizational knowledge. Third, culture creates the context for social interaction, and fourth, culture shapes the process by which new knowledge is created, legitimated, and distributed in organizations. Empirical work on culture shows that subcultures often lead their members to define important knowledge differently than other groups in the organization. De Long and Fahey (2000) describe a major electronics firm where engineers viewed knowledge sharing and personal relationships as integrally related and believed that any attempts to manage knowledge must facilitate such social interactions. This was contrasted with the firm's information systems subculture which was procedurally oriented and heavily rule-bound, placing a high value on standardized processes. Such different views of knowledge often lead to miscommunication and conflict between functions and impede information flows, as subcultures apply different criteria in valuing knowledge.

Inefficient organizational processes

At DevCo, limitations associated with the learning process focused on complexity of the learning system and amount of time investment required to compile project reports, attend project reviews and document lessons learned. At TeleCo, post-project reviews were not conducted at project end simply because there was no requirement to do so. In addition, there were no guidelines on how to conduct post-project reviews or capture lessons learned. A few

select projects were discussed by top management depending on their financial performance and impact on the organization's bottom line.

These findings are supported by existing research on reasons for the lack of effectiveness of post-project reviews. For example, Lilly and Porter (2003) found that improvement reviews were a low priority in new product development organizations. In their study, most of the firms interviewed reported conducting reviews only on selected projects - major or unique projects. Other researchers found that few companies examined their completed projects in any depth (Gulliver, 1987) and that learning from past mistakes, or even building upon past successes, continued to be the exception rather than the rule (Harris, 2002).

Incomplete capture of project knowledge

Some program officers at DevCo reported not having the requisite training to facilitate project review exercises and systematically document lessons learned, therefore making the lessons learned from their respective programs inaccessible. At TeleCo, project managers reported recurring problems with equipment shipments attributed to incomplete documentation both in placing orders for materials and in interpreting requests for materials. The ability to harvest project knowledge and prepare it in forms and formats that are transferrable is critical to project-based learning. Codification practices that rely on transfer and distribution of project knowledge are negatively impacted by a lack of documentation skills.

These findings concur with existing human resources research that links skills development and learning to organizational performance (Gravan et al., 1997). The importance of training capabilities for any organizations is well recognized, especially for those agents concerned with preserving intellectual capital (Carneiro, 2001). Greco (1999) claims that one of the key elements of successful knowledge management is education to help employees recognize what knowledge is valuable, and therefore merits sharing. Unless people in organizations possess the learning capability to use knowledge creatively, a well-developed knowledge management or learning system cannot be directed at sustaining profitability (Hwang, 2003). The lack of skills required to capture and communicate learning processes negatively impacts knowledge representation, its storage and retrieval for future reference.

Insufficient funds

Lack of money was cited as a main barrier to learning efforts at DevCo. Participants reported a lack of funds to provide operational infrastructure such as supporting technologies. Based on a South African field study of barriers to effective knowledge management, Herrmann (2011) recognizes that technological barriers to knowledge management may be caused by the lack of hardware and software, or the cost of technology may be too high for the organization to afford. The author suggests using simple technologies and free software where possible to work around cost issues.

Lack of supporting technologies

Historically, an overarching technology problem in this part of the world has been the lack of basic technological infrastructure and where technology exists, shortages in electricity supply have meant limited access to the internet and other technology-supported applications. In spite of these challenges, Sub-Saharan Africa is currently undergoing what has been dubbed a mobile digital revolution. Ericsson's 2014 mobility report index predicts that there will be about 930 million mobile subscriptions in the region by late 2019. In addition, initiatives like Google's Project Link[4], which builds fiber-optic networks, are making it possible to connect more people to the Internet.

An interesting technology-knowledge related issue was raised at TeleCo. Given the convenience and ubiquitous use of mobile phones in Africa in general, these mobile phones are the preferred means of communication. A lot of project information is shared among project team members, across teams, with the wider organization and beyond using mobile phones. On the one hand the technology has revolutionized communications and access to and use of information. On the other hand, the type of knowledge embedded in these phones is not (yet) directly linked to or feed into the organization's knowledge base. Unless employees take the initiative to individually transfer this information, the text messages are easily deleted when the phone is out of space, and important knowledge is lost. At the same time, mobile phone messages can be considered as a type of knowledge that required special attention in order to make it accessible and interoperable with the organizational knowledge base. In addition to technology, these messages are short and use many colloquial phrases such that accessing them

[4] http://www.google.com/get/projectlink/

is not enough. They would need to be translated into *common speak* before integration in formal knowledge bases.

At DevCo, participants reported restrictions on the use of funds for technology investments. The technology barriers reported at DevCo are more related to a lack of budget or funding than the technology itself. This issue is addressed under insufficient funds.

Knowledge Type

Tacit knowledge: Difficulty in capture and transfer

At DevCo, the participants' preference to "show" their work, rather than write or document the processes involved, reflects the type of knowledge involved. Tacit knowledge is hard to articulate and difficult to transfer by writing it down or texting. This difficulty may have contributed to problems with documenting project information. Tacit knowledge is difficult to exploit organizationally even when it is clearly articulated (Sanchez & Heene, 1997). This is because to appropriate knowledge from someone else means having a shared mental model or system of meaning that enables the other to understand and accept that knowledge (Bresnen et al., 2003).

These findings concur with examples in the literature about other fields where the nature of knowledge is highly tacit. For example, DeSouza (2003) identifies one of the barriers to effective use of knowledge management in software engineering as the inability to capture and categorize required knowledge. The author describes a programmer's experience in contributing a note to the knowledge management system - the contributor could not find the right category in which to place their insight and spent over an hour detailing half a paragraph, to capture all factors surrounding the issue. Making this kind of knowledge explicit is a costly endeavor as employees have to attend to other work tasks.

Limited transferability of some types of project knowledge/uniqueness

With regards to uniqueness, this issue was not reported to affect learning at DevCo. However, at TeleCo each client presented different project requirements, specific to their business needs. The extent to which unique project requirement pose challenges to learning from previous experiences lies in the inability to re-use existing templates or apply existing solutions to solve new problems in these specific problems. The project teams had to come up with custom

solutions to these situations, without the possibility of ever using these solutions again. Unique projects therefore do not allow for experience accumulation over time.

Summary

At TeleCo, social-cultural factors were perceived as having the most impact on learning practices. The oral and informal work culture, and professional sub-cultures encouraged face-to-face communication, taking advantage of the richness provided by this medium to communicate tacit knowledge during project implementation. However, learning practices oriented towards knowledge codification were not equally developed limiting transferability and re-usability of knowledge across projects.

At DevCo perceived barriers to learning across projects were largely attributed to limitations in resource and organizational processes. Participants reported insufficient funds and the absence of supporting technologies as factors that compromise the project's ability to perform its tasks. Resource constraints are bound to have a negative effect on all organizational processes.

Influence of Learning Barriers on Learning Practices

People-Centered Barriers

People-centered barriers reported in this study include a lack of time to reflect on learning, lack of trust among project team members and between employees and managers, and inequalities in power and status. The lack of reflection time means that lessons are not identified from past experiences. This raises the possibility of repeating past mistakes. In addition, the lack of trust limits the frequency and quality of knowledge exchange possible among project team members. Without trust, knowledge offered is not appreciated and in turn knowledge needed is difficult to access since the social networks through which it flows are not open or inclusive to all project team members. Moreover, lack of trust feeds into inequalities as it pits those within networks against those without, causing resentment among project team members who may feel excluded from decision making and further limiting knowledge exchange within and across projects.

Combined this set of barriers seems to favor a patch work of reactionary measures, that are not necessarily standardized, and are mainly dependent on people as knowledge repositories.

The learning practices reported at TeleCo (e.g., demonstrating skills, using text messages, co-location with project team members, etc.) seemed more reflective of this state of affairs than those reported at DevCo. The practices reported seemed to evolve as needed and documentation practices were not well developed, perhaps owing to the fact that capturing knowledge in this form would make it more readily available to everyone diminishing the power or control knowledge owners had over the others.

Although the people focused practices seemed to work well for project execution at TeleCo, they were not very effective for project-based learning on their own. Solutions that address the specific people-centered barriers reported would help to create a more learning friendly project environment. Some of this may include building reflective time into work schedules so that project team members can review previous performance and identify areas for improvement, building credibility of all project team members by soliciting and acknowledging contributions from everyone, for instance rewarding individuals for knowledge sharing. Reward systems may also be used as a motivational tool to encourage more knowledge sharing and collaboration among project-team members.

Organization-Centered Barriers

The organization-centered barriers reported in this study include organizational culture, work structure, lack of funds, lack of access to supporting technologies and inefficient organizational processes. More than all the other barriers, organizational culture influences the behavior and relationships within a given project team and subsequently the associated knowledge flows which follow the relationships in place. Given the results, it would appear that different mechanisms and approaches would be needed depending on the project-based organization's structure. For an organization with an informal structure, mechanisms to counter the lack of documentation should be adopted. While the formal organization would need more practices that encourage informal accumulation of skills and repetition.

The relaxed informal work structure at TeleCo seems to have favored an oral culture, and the development of spontaneous and natural information seeking routines such as asking questions and working alongside other project team members. However, these routines on their own are not enough to sustain project-based learning as the configuration of team members and objectives change with each new project. Routine practices would have to be supported with

more persistent solutions so as to provide a frame of reference for the next project and to avoid re-invention. Such practices may include developing a record keeping process where lessons capture is encourage throughout the project execution phase and lessons reviewed at the end of a project and shared with subsequent projects. Ideally, the lessons identification and capture process should be systematic with some form of standardization such that it can be replicated across different projects.

Culture also influences which types of knowledge are important and how they are shared. In the context of TeleCo, the valuation of knowledge other than a project's financial performance may involve a strategic shift that defines learning or the re-use of project lessons as important to project success much like the financial aspect. This would have the effect of more project team members paying attention to the capturing and sharing lessons learned from project experiences.

In the case of DevCo where a learning system exists but is so cumbersome that participants expressed frustration at the burden of documentation, a possible solution would be to vary or integrate other means of capturing project knowledge. For example, beneficiary testimonials could be captured via video or stories other than writing project reports. Another option would be to work in groups or along thematic lines in writing project reports and identifying lessons learned so information is validated with peers and the burden of reporting is shared with the group instead of the single project officer working alone.

The influence of structure on development of learning practices may also be compared from a quality vs. quantity perspective. At TeleCo the ease of access to colleagues and co-location of project team members makes for a high quantity of available project information. However, comments from participants seemed to indicate that quality information was not easily accessible. At the other end, DevCo had an elaborate documentation system and new email policy which although they restricted personal opinion were well regarded as sources of valid project information. Therefore quantity of interaction is not directly proportional to quality of information generated.

Knowledge Type Barriers

Based on the extensive knowledge articulation and codification practices reported at DevCo, it seems that project knowledge was largely explicit and easy to share among project team members. The practices reported (e.g., preparing project reports, meetings with community

partners, sharing information from external training sessions, etc.) are consistent with the ease of sharing this type of knowledge. At TeleCo, however, the tacit nature of the type of knowledge needed to execute project tasks encouraged oral and socialization modes of transmission which make knowledge difficult to capture and preserve for posterity.

Whereas DevCo was more document leaning and TeleCo more social-interaction leaning, both organizations had some practices, although not well developed, that catered to the other type of knowledge. To improve efficiency, organizations with dominant tacit knowledge should encourage knowledge articulation and capture practices to make their knowledge sharable. TeleCo could use more meetings, project review exercises, reports and databases. On the other hand, organizations with well-developed knowledge capture systems are usually accompanied by similarly well-developed knowledge articulation systems since articulation precedes capture. More support is needed for experience accumulation practices that support the development of routines. DevCo could complement its project evaluation process with informal knowledge sharing spaces and encouraging experimentation and learning through failure.

Different approaches to Project-Based Learning

Learning Intention

For purposes of this study, learning intention is loosely defined as a purposeful approach to the capture, transfer and adaptation of knowledge from projects. Empirical results from this study showed that TeleCo had a flexible, adaptive approach to project-based learning compared to DevCo's predictive approach which drew upon and reinforced learning procedures common to the global DevCo family.

Results show that DevCo was purposeful in its approach to the management of project knowledge. They had a continuous project review process and defined procedures for collecting and reporting on project activities. In addition, regular meetings ensured communication between different programs and training opportunities constituted enhanced staff skills. More than the different learning practices in place, one member of the management team was a learning champion, describing DevCo as a learning organization and taking it upon himself to ensure that program staff had diaries to record insights during project execution. The involvement of

management aligned learning goals with his vision for the organization thereby legitimizing learning practices.

On the other hand, the definition of project success at TeleCo was based on time, budget and scope. The idea of learning investment, in addition to day-to-day project tasks was not the way things worked. There was a lot of knowledge sharing in informal interactions; however, this project knowledge was not always available for re-use. Learning was not intentionally planned. In speaking to project team members, the concept of project based learning seemed reasonable to them, like a list of frequently asked questions. However, they didn't have an organization-wide system of collecting and making this information available. Learning at TeleCo was not purposeful.

Sparrow (2001) argues that the purposefulness (or lack of) with which organizations develop knowledge management and learning systems may be attributed to either predictive or adaptive operational models. The development of a formal organization system for knowledge identification, definition and evaluation as an approach to knowledge management, or "articulation of the knowledge base" (Chattell, 1998, p. 150), is rooted in the philosophy of predictability, measurement and control. An alternative philosophy might place less emphasis on the decontextualization of knowledge through its description and measurement, and more upon chaos theory (Stacey, 1992) notions of a self-correcting, flexible and dynamic knowledge process through which the business secures its adaptivity (Sparrow, 2001). The instability of the business in light of the volatility of its environment, may place a premium upon adaptivity rather than predictability and more rigid configuration.

Influence of Culture

The influence of organizational culture at both organizations was profound. At TeleCo, the work is very hands-on. Sharing tips in the field and learning on the job is a main feature of the work life. At TeleCo an informal culture permeated the organization with preference for oral communication. This was also reflected in the preferred learning practices. In addition, a sub-culture of engineers was reported among project team members.

At DevCo on the other hand, projects and programs are well planned beforehand, making sure all contingencies are in place before launching. Training is done before the job starts. For DevCo, the accountability and reporting requirement of donor funded organizations influenced

everything. The learning system was developed to provide guidance and meet reporting guidelines, hence the heavy reliance on documentation.

Knowledge projects in larger firms have tended to emphasize the explicit technical knowledge associated with good practice in the execution of particular procedures. Bureaucratic forms of organization therefore seek to fractionate and proceduralize working practices. However, even within large companies, knowledge system developers have found that the information of the form that constitutes manuals is not sufficient to secure effective transfer of knowledge between users (Sparrow, 2001). The strict logic and theory of how to carry out tasks may not be the most appropriate thing to transfer. Experience is retained in human memory as episodes or specific case based information.

Learning needs

The learning approaches of the two organizations may also be considered from an information needs perspective. At the individual level, project team members have the same need for information – to develop personal skills and competencies. At the group or project level, the information is needed in a problem solving context. Project teams seek information to apply to and execute real time projects. At TeleCo, this process is the same at the organizational level. Project knowledge is applied to solve problems in the immediate project context since the projects have a short life span.

The project-level learning needs at DevCo are similar to those at TeleCo but in addition, project knowledge is considered for anticipated problems and applied to modify past actions. Unlike TeleCo, DevCo has a program-based approach, which means the projects have longer lifespans, at times extending over several years. In the case of a multi-phase project spanning several years for example, project knowledge from initial phases can be used to anticipate and avoid or control future problems. In addition, knowledge from the second phase may be used to modify results of a previous phase. For example, new roofing materials discovered in phase two, may lead to retrofitting the roof of a school built in phase one.

The SME Consideration

Dominance of Socialization Practices

In SMEs, socialization is the predominant way through which knowledge transfer occurs from the business owner to employees and between employees (Desouza & Awazu, 2006). Socialization is a sub-process of the knowledge creating cycle in which knowledge in tacit form is moved between individuals. Nonaka and colleagues developed the knowledge creating cycle comprising of four processes – socialization, externalization, combination and internalization (Nonaka & Takeuchi, 1995; Nonaka & Toyama, 2003). Externalization is the application of tacit insights on an external entity, combination involves synthesizing explicit pieces of knowledge, and internalization is the processes where by one increases their knowledge by learning from external events. Small organizations use formal and informal socialization methods to transfer knowledge, including: weekly meetings, apprenticeships, and close proximity among employees which encourages conversation, communication and builds rapport.

Based on results of this study, the dominance of socialization was more evident at TeleCo, than at DevCo. Socialization practices used at TeleCo included informal interactions, working in close proximity with different teams (co-location), deliberate staff assignments, site visits and tours. Whereas DevCo used some socialization practices as well, externalization and combination, as evidenced by focus on reporting and documenting project activities and outcomes were more prevalent.

Common Knowledge

Common knowledge in terms of both depth and breadth is prominent in small and medium-sized enterprises - SMEs (Desouza& Awazu, 2006). Common knowledge is knowledge known to all members of the organization. It helps in the conduct of work in organizations by providing a common frame of reference, i.e. each employee has a very similar foundation and grounding in organizational matters. Due to this common knowledge, employees in small organizations such as restaurants and coffee shops can frequently, and often do, fill in for one another. The authors propose that common knowledge eases knowledge transfer, sense making and knowledge application.

This study did not specifically ask respondents about their common knowledge. That said, the set up at TeleCo provides clues on the presence of a broad common knowledge base.

Projects are carried out by the operations team which is mostly composed of engineers with civil or electrical specializations. Most of these engineers have trained at the same schools and share a common understanding of technical terms used in the engineering profession. It was described as a sub-culture. In relation to DevCo, there is more turnover at TeleCo, and when an engineer leaves the company, their tasks can be completed by colleagues (due to common knowledge) while a replacement is sought.

DevCo was more diligent in role definition, making sure each desk and field officer had their specific tasks. While the rate of turnover at DevCo was low in comparison to that at TeleCo, the tasks assigned to one person sometimes could not be easily assumed by their colleague as they did not have all the pertinent knowledge at hand. In part, this was the reason behind establishing a company-wide email policy to share project-specific information with all parties involved such that in the case of an absence, other colleagues would have information to act upon. The lack of common knowledge has been known to impede the flow of knowledge, resulting in failures to stimulate innovation and creativity in organizations (Szulanski, 1996).

In addition, SMEs studied did not show a problem with knowledge loss, rather some of mature SMEs had deliberate mechanisms in place to prevent knowledge loss from becoming a problem (Desouza & Awazu, 2001). The authors propose that in the face of resource constraints, SMEs cannot develop knowledge repositories and therefore concentrate their knowledge in common knowledge, available to all employees and in the head of the business owner, manager or director. In this model, common knowledge is easily available, enabling flexibility to move staff to cover positions left vacant when employees leave. Moreover, most SMEs have a quick hire-and train cycle, and hire from within the industry. The knowledge space of interest to SMEs is limited and well-defined compared to larger organizations; hence new employees do not feel overwhelmed with the amount they must learn in order to work effectively.

Exploitation of External Sources of Knowledge

Since they are resource constrained and cannot spend effort to create knowledge, they look outside the organization for knowledge e.g., family friendly cafes using market research from chains like Starbucks to choose business locations (Desouza & Awuza, 2006). In addition to making use of ready-made external knowledge, SMEs make it a priority to be well connected with their localities, in order to remain relevant to their customers.

In this study, DevCo had developed an extensive network of partnerships and relationships with different agencies in the development space, which sometimes helped the organization to cover its resource gaps by partnering on different initiatives or loaning staff in one area in exchange for staff in another area where they had shortages.

At TeleCo, the organization had developed a strong customer relationship management program based on keeping the client informed of project progress on an ongoing basis. In this way, the organization was able to stay in touch with the needs of their clients, solicit feedback and make adjustments to improve their services.

Based on these considerations, it seems that small organizations do not manage knowledge in the same way as do larger organizations (DeSouza & Awazu, 2001). Small organizations have resource constraints which require them to be creative in working around these limitations. Socialization practices involving alternatives to technological solutions are important for connecting people, building trust and improving the ease of knowledge transfer. A common knowledge base can improve speed of execution, prevent knowledge loss, and the potential to exploit knowledge from external sources. These are some of the mechanism specific to small organizations that are used to acquire, retain and transfer knowledge across projects and the wider organization.

6.5 Conclusion

The purpose of this study was to develop a broad overview of project-based learning from the perspectives of project team members at two small organizations in Uganda. Based on the problem statement introduced in Chapter 1, the learning practices used in contemporary project-based organizations have not been successful in achieving project-based learning. This study focused on identifying learning practices, the barriers encountered in implementing them and how the barriers may be addressed.

While the results of this study do not provide definitive answers for the breadth of project-based organizations out there, this study found that learning practices used were both formal and informal. The informal practices were mostly employee-led, cheap and easy to use, did not require much pre-planning and followed a natural path of knowledge sharing and learning. Formal learning practices on the other hand were organization-led, did not come naturally to participants, and required systematic implementation.

Learning practices seemed to develop in response to specific learning barriers in a given organization. For example participants at TeleCo reported a wide range of informal learning practices which seems to correspond to an informal organizational structure, relaxed work culture, abundant generation of tacit knowledge, and reliance on people as knowledge repositories. The reported learning practices do not necessarily address learning at TeleCo as evidenced by the lack of reflective practices to identify insights and learn from experiences. It would seem that the most pressing learning barriers at TeleCo were a lack of standards around learning from projects and not maximizing knowledge repositories other than people.

Participants at DevCo reported an elaborate system of project evaluation and documentation which corresponds to a formal, rule-based organizational structure, manipulation of explicit knowledge, and reliance on procedures as knowledge repositories. DevCo had a learning system in place, supported by resources from the parent company and the ability to share resources with other community organizations. However, the current system did not seem to support innovation since everything had to be done a certain way.

It would seem that an informal work structure that supports tacit knowledge is riddled with people-centered barriers and as such, appropriate learning practices should address these barriers such as building trust among project team members, diffusing inequalities in power and status, and providing more time to reflect upon past experiences.

Similarly, a formal work structure that favors manipulation of explicit knowledge is faced with organization-centered barriers that would be addressed by learning practices such as developing user-centered learning systems that are easy to use and are not burdensome to the learner, providing more funds to project-based organizations to access supporting technologies, and promoting a learning-friendly culture that encourages experimentation, learning from mistakes, and rewards knowledge sharing.

6.6 Implications of the Study

This study advances theory about knowledge transfer and learning in organizations and provides practical insights for the management of learning in project-based organizations.

Implications for Theory

The nuanced view of project-based learning presented in this study is consistent with empirical evidence on project-based learning, which shows that although knowledge transfer and learning may happen naturally in project settings, they are often incomplete. The research presented here provides a deeper understanding of the conditions under which project-based learning is successful and the conditions under which project-based learning is unsuccessful.

The study highlights the importance *knowledge reservoirs* in project-based learning. McGrath and Argote (2001) proposed that knowledge is embedded in the three basic elements of organizations—members, tools, and tasks—and the various subnetworks formed by combining or crossing the basic elements. The basic elements of organizations combine to form subnetworks through which organizational knowledge is transferred. With the use of people as agents for learning at TeleCo and work processes as the main agent for knowledge transfer at DevCo, this study confirms McGrath and Argote's subnetworks for organizational knowledge transfer. The member–member network is the organization's social network. The task–task network is the sequence of tasks or routines the organization uses. The tool–tool network is the combination of technologies used by the organization. The member–task network (or the division of labor) maps members onto tasks. The member–tool network assigns members to tools. The task–tool network specifies which tools are used to perform which tasks. The member–task–tool network specifies which members perform which tasks with which tools.

According to the framework, organizational performance improves with increases in both the internal compatibility of the networks and their external compatibility with other networks (McGrath & Argote, 2001). For example, one of successful learning practices reported involved the member–task network; allocating tasks to the members most qualified to perform them. Similarly, when members have the appropriate tools to perform the tasks allocated to them, the member–task network is compatible with the member–tool network. This study showed incompatibility in the networks when there was a lack of supporting technologies at DevCo. The

barriers to project-based learning can thus be interpreted as sources for incompatibility in the networks.

This study also validates the learning landscapes framework introduced by Prencipe and Tell (2001) and further elaborated by Brady et al (2002). The learning landscape offers an interpretive framework accounting for the empirical diversity of the learning practices used in a given organizational context. Based on the knowledge processes of experience accumulation, knowledge articulation, and knowledge codification, the framework identifies learning practices across three levels of analysis. The combination of learning practices presents either a people-dependent (explorer landscape) learning profile or an implementation-dependent (navigator landscape).

The learning landscape illuminates the importance of context in project-based learning. Argote and Miron-Spektor (2011) proposed that organizational learning is an ongoing cycle through which task performance experience is converted into knowledge which in turn changes the organization's context and affects future experience. The organizational context (characteristics of the organization, such as its structure, culture, technology, identity, memory, goals, incentives and strategy) affects the experience acquired. In turn, the context interacts with experience to create new knowledge. This study showed that the informal work structure at TeleCo created a relaxed oral culture of knowledge exchange while the formal context at DevCo called for rule driven, documentation focused knowledge transfer strategies.

As well, this study makes methodological contributions in using a multi-level unit of analysis, learning practices. This allowed for identification of empirical instances at the individual, group, and organizational levels. Rather than focus on either the dynamics of individual learning, or project team interactions, or organizational systems alone, this study captured learning practices across all levels, thereby emphasizing the learning processes.

Furthermore, the study contributes to project management research by suggesting that learning is a key contributor to the success of project-based organizations in addition to the triple constraints of time, cost and scope. Learning theories are not yet widely used in project management literature since the link between learning and performance is yet to be proven. Ruuska (2005) observed that research has been slow to develop procedures for capturing and sharing knowledge in the project-based business environment with the first studies on project knowledge management only dating back to 1987 (i.e. Boddie, 1987; Gulliver, 1987). As such,

the discourse on learning as a main contributor to successful project performance is only at a nascent stage.

Explanation of Unexpected Findings

Project characteristics as barriers to project-based learning

The effects of project characteristics on learning practices were not directly addressed in the interviews. Based on the literature review, the temporary nature of projects and short-term goals were highlighted as presenting learning barriers. At TeleCo, the nature of work involved finite tasks that were completed within the scheduled time. The temporary or short-term nature of these projects did not present impediments to learning but rather suited the required tasks and nature of work. At DevCo, the program focus catered to long-term projects that spanned several months and years, allowing for lessons from previous phases to be recalled and applied to improve subsequent phases. DevCo did not have any concerns with temporariness.

The fact that project characteristics were not much reported as a barriers to learning from and across projects contradicts existing research. Several researchers have suggested that the short-term nature of projects prohibits the development of natural learning mechanisms such as routines developed in more stable organizations and therefore hinders learning. In addition, the high turnover of staff and disbandment of the project team when a project closes have been cited as leading to a fragmentation of the team's collective knowledge and therefore hindering learning. The uniqueness of project tasks is another factor cited in the failure to transfer knowledge from project to project since the unique knowledge is not relevant to other projects. One possible explanation as to why these factors were not specifically reported as project characteristics maybe due to the fact that within the reality of the project or project-based organization, these characteristics become organizational characteristics, manifest in the culture, structure and overall configuration of the project organization. For example, it is possible that compared to a long term organization, the mobility of personnel within a temporary organization, such as a project, is a specific characteristic. However, dealing with two project-based organizations, personnel mobility is a part of how these organizations function and is exploited as a mechanisms to transfer knowledge across projects.

Role of technology in project-based learning

Based on the codification strategy discussed in the literature review, this study anticipated that technology would have an important role in any form of project-based learning system. The findings of this study showed that where applicable, technology facilitated communication, the creation and maintenance of records and providing access to project information.

For example, all the study participants at TeleCo had access to a computer and a company paid mobile phone to maintain communication with head office when deployed to project field sites. Although many text messages were exchanged between project teams, the access to phones and computers did not seem to greatly enhance the transfer of project knowledge. In spite of what seemed like obvious needs for computers and other communication technologies, DevCo did not have sufficient funds to acquire these tools. Instead, they relied a lot on resources from the wider DevCo family, re-used forms and templates and followed guidelines in documenting all project activities. In addition, DevCo had partnerships with many community organizations and other agencies in the development sector and used these networks to fill some of its resource gaps. Limitations in technology did not seem to prevent development of a fairly strong learning system at DevCo.

The reduced role of technology in the organizations studied may be explained by research on knowledge management in small and medium size enterprises (SME). According to Sparrow (2001), the technological emphasis in large firms and SME knowledge systems differs in that large firm KM products place their primary emphasis upon the means to get information to users, as opposed to the contribution of the utilization of information. SMEs on the other hand, emphasize the development of knowledge as a lens in which to view their business, as opposed to a knowledge management system. In addition, SMEs emphasize knowledge system principles, and not technological knowledge system elements. Technology is not made part of the knowledge management equation, rather, knowledge is created, shared, transferred, and applied via people-based mechanisms including: face-to-face meetings, observations, apprenticeship training, informal meetings, job rotations, and reminding employees of the core mission of the organization, etc. (Desouza & Awuza, 2006). The knowledge generated is immediately put into practice through the organization's culture, instead of using technology to store the knowledge in databases.

Employee sentiments towards inclusion

Although not part of this study's objectives, participants reported feeling "left out" or "not included" in making decisions affecting the project since information was shared with some people and not others. In addition, what would have been a rudimentary project evaluation process was limited to a few project and only involved the project manager, finance officer and a member of the management team. Individual employees resented the fact that they were not consulted in decisions to terminate or continue difficult projects which they would have invested considerable amounts of time.

Implications for Practice

While this study alone cannot address all project-based learning issues in practice, this study suggests that learning managers in project-based organizations should understand their context of operation, take note of the knowledge repositories their employees use naturally, and align learning strategies with the goals of their organizations.

Practitioners would be well served in using the conceptual framework propose in this study as a template to conduct a learning practices audit. This audit would enable learning managers to determine where the bulk or focus of their current practices lie and work backwards to identifying the conditions in their organizations that influence or shape the learning practices.

Depending on the learning barriers or conditions present in their organizations, practitioners can take steps to address these barriers. For example for

People- centered barriers

- Integrate free-time into the design of work processes such that project team members have time in between projects or project phases to pause in the action and encourage thoughtful reflection on the organization's processes to draw insights for improvement.
- Diffuse power inequalities among project team members by using reward mechanisms to encourage and recognize contributions from all members and validate the voices of the less vocal team members.
- Engage in activities that build camaraderie among project team members like off-site exercises and interactions outside work that get people to talk to colleagues in different roles and positions.

Organization-centered barriers

- Invest in user-centered learning systems that are easy to work with and are integrated in the workflow process so project team members do not feel burdened to perform additional tasks.
- Provide support in terms of training team members on how to use the system and how to prepare proper documents such as lessons learned, making clear to them the connection between learning and project outcomes
- Include project team members in decision making about matters affecting the projects they are working on to build ownership of the results
- Develop an enabling environment that supports learning. Garvin et al. (2008) suggest including the following factors in such an environment: psychological safety (ensuring that employees are comfortable in expressing their thoughts about the work at hand), appreciation of differences (recognizing the value of alternative worldviews), and openness to new ideas (employees should be encouraged to take risks and explore the untested).

Technology-centered barriers

- Ensure that new technologies are compatible with legacy technologies and that they are interoperable such that knowledge is not lost between transitions
- Match the technology to the needs of the project team members. If the technology is too advanced, individuals may shy away and fear to admit ignorance. Training should be provided so team members know how to use project databases and to locate project information.

Knowledge type barriers

- Practitioners should pay attention to both tacit and explicit forms of knowledge, equally rewarding contributions to the less tangible forms of learning.

6.7 Limitations of the Study

This study employed a multiple-case study design to explore project-based learning based on reflections and perspective of project team members in two small organizations in Uganda. While case studies have been suggested as most suited for investigating contemporary phenomena within a real-life context (Yin, 2009), the limitations of case studies are well documented (Yin, 2009). The results of this study cannot be generalized to other organizations. Although it is never a goal of qualitative methods to state objective truths within a phenomenon, or to generalize the results (Hoyt & Bhatti, 2007), the findings of this study are limited to the organizations studied. Nevertheless, suggestions can be made to similar organizations or other organizations in the same setting.

In addition, the data generated from interviews was self-reported data, that is, the opinions and perceptions of the interview participants. Brutus et al. (2013) argue that self-reported data is limited by the fact that it rarely can be independently verified. In other words, one has to take what people say, whether in interviews, focus groups, or on questionnaires, at face value. However, self-reported data contain several potential sources of bias that should be noted as limitations:

- selective memory - remembering or not remembering experiences or events that occurred at some point in the past;
- telescoping - recalling events that occurred at one time as if they occurred at another time;
- attribution - the act of attributing positive events and outcomes to one's own agency but attributing negative events and outcomes to external forces; and,
- Exaggeration- the act of representing outcomes or embellishing events as more significant than is actually suggested from other data.

Furthermore, the study was retrospective, asking participants to share experiences about past events. As discussed, there is a problem of imperfect recall and more so an inability to validate past events, especially where record keeping is not strongly adhered to.

6.8 Future Research

Additional research seem needed on learning analysis across individual, group, and organizational levels, and the learning processes of experience accumulation, knowledge articulation, and knowledge codification. The conceptual framework introduced in the study and expanded in the explorer and navigator landscapes presents one possible interpretation. In its present form the landscape framework is descriptive. Future research would explore more possibilities in conceptualizing the relationships outlined and develop the framework into a prescriptive model.

The study reported here was exploratory in nature and used qualitative methods to generate initial findings. Based on the results of this study, future work could use quantitative methods to learn more about the twelve categories of learning practices identified from the interviews, and their interaction with organizational characteristics. Furthermore, since not all the barriers identified may be feasibly addressed by a single organization, future work could look into uncovering the most significant barrier to each type of learning practice.

Future research may also explore the facility of using an action research approach where data is collected in real time and readily verifiable and test whether those results are similar or different for results of the current study which used a retrospective approach.

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APPENDICES

Appendix A.1 Research Invitation

A study of Project-based Learning at [organization name]

Organizing by projects is popular across a wide range of industries since projects offer agility and the option to work smarter, innovate faster and meet objectives in an increasingly complex business environment. Despite these advantages, many project based organizations do not learn from their experiences. Lessons learned in one project are not transferred to the next such that mistakes are repeated, work is re-invented and many projects fall short of expectations. This study explores the practices used to acquire, retain and transfer lessons learned across projects and the barriers encountered in learning from project experiences.

Dear Mr. / Ms. / Miss. / Mrs. / Dr. ____

You are invited to participate in an interview as part of a research study on project based learning at [organization name].

This invitation is extended to all persons who were part of project/program _____, completed within the past year. The study is intended to examine how lessons learned are collected, recorded, and transferred from one project to another and from project to the wider organization. This interview will be led by Ms. Irene Kitimbo, a doctoral candidate in the school of Information Studies at McGill and will inform Irene's doctoral dissertation. Your participation in this study is much appreciated.

Please take note of the following procedures:

- Your participation in this study is voluntary.
- The interview will last approximately 1 hour and 15 minutes, including time to complete preliminaries and wrap up.
- Your responses to interview questions will be treated confidentially; Irene will only share aggregate results with the organization.
- Your name and those of your co-workers, or the details of any projects you may be working on will not be shared in any part of this study. All information will be kept anonymous.
- The collected data will be housed on a secure server at McGill University.
- Your organization will not have access to any raw data. Only members of the academic research team will have access to this data.
- You have the right to withdraw consent and discontinue your participation from this study at any time without penalty or consequence.
- The researcher intends to publish the study's results in scholarly journals, a dissertation report and at academic conferences. In all publications, the identity of research participants will remain confidential.
- Should you have any questions or concerns about these procedures or the research project in general, please contact:
    - Ms. Irene Kitimbo by email: irene.kitimbo@mail.mcgill.ca or by Phone: +256-xxx-xxx-xxx (local) or +1-xxx-xxx-xxxx (Canada) or
    - Dr. Kimiz Dalkir (Dissertation Supervisor) by email: kimiz.dalkir@mcgill.ca or by phone: +1-514-398-3749.

- For any questions about your rights as a participant, please contact Ms. Lynda McNeil in the Office of Research Ethics at McGill University by email: lynda.mcneil@mcgill.ca or by phone: +1-514-398-6831

The risks associated with participating in this interview are minimal and are no greater than those you may encounter in your day-to day work life. Before beginning the interview session, you will be asked to give your consent to participate in this study.

Irene will be available for interviews at your organization on the specific days and times indicated in **GREEN** on the interview scheduling tool. There will not be any interview slots available on the days and times indicated in **BLACK**. For example, Monday, Wednesday and Friday are displayed in **GREEN** for your organization, meaning you can reserve an interview session on any of these days by double clicking on one of the times displayed. After you have clicked on a time, the display will change from **GREEN** to **GREY**. Tuesday and Thursday are displayed in **BLACK** and there are no interview for your organization on those days. Please follow the link below to access the scheduling tool and reserve your preferred interview spot (up to two preferences).

Interview Schedule for organization _____

	Monday	Tuesday	**Wednesday**	Thursday	**Friday**
Morning	9:00-10:15 am		9:00-10:15 am		9:00-10:15 am
	11:00 am-12:15 pm		11:00 am-12:15 pm		11:00 am-12:15 pm
Afternoon	1:00-2:15 pm		1:00-2:15 pm		1:00-2:15 pm
	3:00-4:15 pm		3:00-4:15 pm		3:00-4:15 pm

A confirmation of will be sent to your email within 24 hours indicating date, time, and location of your interview. You will also be assigned a unique participant identification number, which will be used to tag all the information related to your participation in this study.

Thank you for your participation.

Sincerely,

Irene Kitimbo, PhD Candidate
School of Information Studies, McGill University
3661 Peel Street, Montreal
Quebec H3A 1X1 Canada

Appendix A.2 Interview Confirmation

A Study of Project Based Learning at [organization name] - Confirmation

Dear Mr. / Ms. / Miss. / Mrs. / Dr. _____ [P001]

Your interview for the research study on project based learning has been scheduled for:

Tuesday, July 10th, 2012 at 9:00 am.

Irene will be waiting for you at:

Staff meeting room on the 2nd Floor

The interview session will consist of 20 open-ended questions which will be presented in three parts. The first part will deal with general demographic information and introduce the research topic. The second part and heart of the interview will discuss your learning experiences, focusing on different aspects of how you access, share and use project- level knowledge. The final part will review highlights emerging from part 2 and provide you with the opportunity to pose questions and make suggestions for improvement.

The interview should take no more than 1 hour and 15 minutes (75 minutes). Please arrive on time. The procedures will be reviewed prior to beginning the interview.

Thank you for your participation.

Sincerely,

Irene Kitimbo, PhD Candidate
School of Information Studies, McGill University
3661 Peel Street, Montreal
Quebec H3A 1X1 Canada

Appendix A.3 Interview Questions

Good morning/afternoon _____ (interviewee's name)

Thank you for accepting to take part in this dissertation study on project-based learning. This study is interested in learning about the activities, means and methods used to acquire, retain and transfer knowledge across projects and to other parts of the organization. As explained, this interview will take about 75 minutes. Your responses will be recorded so that I don't miss anything from our discussion. Do you have any questions before we start?

Background Information
1. Please introduce yourself stating your full name, and briefly explain your position in this organization. 2. What is your age? 3. How long have you been employed with this organization? 4. What is your highest level of formal education? Gender _____ (assumed to be explicit) 5. Can you share with me the kind of project(s) or project work you have been involved in the past year and what your role(s) was in these projects.
Learning Experiences
6. When working on a project, what kinds of information or knowledge is typically required to complete your job (e.g., health and safety information, customer specifications) 7. When working on a project, how do you typically find the information or knowledge required to do your job? 8. Which of the sources you consult or the methods you use, are the most/least effective and why? (e.g., colleagues working on same or different projects , databases, library, manuals) 9. Do your colleagues feel the same way about your least effective sources and methods of finding project knowledge, and why? 10. Do you have any suggestion for how the least effective methods can be improved? 11. Are the sources and methods you find most effective for finding project knowledge known to other members of your project team? If not, do you share information about these sources and methods with other project team members and do they do the same? 12. In your experience, what is the best way to share project knowledge with members of your project team and with members of other teams? 13. When a project is completed, what does your organization typically do with the knowledge generated? Is there a system in place or guidelines to follow? Does each team member decide what they do? Who is responsible for collecting and/or organizing this knowledge when the project ends?
Conclusion
14. If you were to design an ideal system for managing project related knowledge in your organization, what would be the must-have features? Which of those important features are missing from the system used in your organization? How can your organization make improvements? 15. Do you have any questions about the study and the topics we have discussed? ***Thank for your time. Your participation in this study is much appreciated.***

Appendix A.4 Pre-determined Codes

Codes	Themes and Descriptions	Examples
	Question 1. What are the learning practices used?	
EXP	1-I Experience accumulation Involves historical experiences and organizational routines	• Learning by doing • Learning by using
ART	1-II Knowledge articulation Involves explicating knowledge to enable faster sharing and transfer.	• Learning by reflecting, • Learning by thinking • Learning by discussing • Learning by confronting
COD	1-III Knowledge codification Involves inscribing what is known, in linguistic and symbolic representations, for storage and transfer across time and space as well as changing knowledge structures.	• Learning by writing, • Learning by re-writing, • Learning by replicating • Learning by implementing • Learning by adapting
	Question 2. What are the barriers to project-based learning encountered?	
PPL	2-I People-centered barriers Personal factors that limit knowledge sharing and transfer	Lack of trust
ORG	2- II Organization-centered barriers Organizational factors that limit knowledge sharing and transfer such as culture, structure, resources	Culture that doesn't tolerate mistakes
ICT	2- III Technology-centered barriers Technological factors that limit knowledge sharing and learning	Mismatch between technology and employee requirements
KNT	2- IV Knowledge Type Learning barriers related to the type of knowledge i.e. tacit or explicit	Difficulty in capturing tacit knowledge
XTS	2-V Project Characteristics Learning barriers related to project-specific characteristics	Temporary nature

Appendix A.5. Some of the Learning practices identified from the study

	Learning Practice	**Knowledge Process**		
		Acquire	**Retain**	**Transfer**
1.	Transfer of experienced staff	√		
2.	Job shadowing	√		
3.	Personal experiences	√		
4.	Demonstration	√		
5.	Site visits and tours	√		
6.	Social discussions over dinner/drinks			√
7.	Phone calls, emails			√
8.	Asking questions			
9.	Stories from the field, anecdotes			√
10.	Discussions with colleagues			√
11.	Meetings - team, project, group			
12.	Project evaluations and review meetings	√	√	
13.	Performance appraisals		√	√
14.	Networking			√
15.	Workshops and seminars	√		√
16.	Project reports		√	
17.	Completion certificates		√	
18.	Site photographs		√	
19.	Checklists		√	√
20.	Templates and forms			
21.	Progress reports		√	√
22.	Record of lessons learned		√	√
23.	Visual charts, maps or diagrams		√	
24.	Cost and expense reports		√	√
25.	Training programs			√
26.	Mentoring			
27.	On the job training	√		
28.	Presentations from staff returning from training abroad			√
29.	Cross training	√		
30.	Using consultants to facilitate project reviews			√
31.	Information office		√	√
32.	Stakeholder consultation and feedback			√
33.	Community engagement			√
34.	Sector working group meetings			√
35.	Policies on how to exchange and share project knowledge			√
36.	Technical advice from the parent organization’s network			√

	Learning Practice	**Knowledge Process**		
		Acquire	**Retain**	**Transfer**
37.	Relationships with clients and stakeholders			√
38.	Transparency and internal control of finance policies		√	
39.	Procurement guidelines and policies		√	
40.	Storing project knowledge in databases		√	
41.				
42.				
43.				
44.				
45.				
46.				
47.				
48.				
49.				
50.				

Appendix A.6. Codes generated for learning practices

Codes	Categories and Descriptions	Examples
Question 1.1 What are the perceived learning practices?		
INFL	**Informal Interactions** Involves casual conversation and information exchanges between employees and project teams.	• Water-cooler conversations • Asking questions • Sending text messages
JOBL	**Learning on the job** Involves acquiring (also improving and perfecting) task knowledge by performing the task.	• Demonstrating skills • Self-study • Experimenting • Teaching by showing colleagues
STAF	**Moving staff around the organization** Involves assigning staff to different tasks, positions and project teams.	• Staff Transfers • Team Assignments • Co-location
MEET	**Participating in meetings** Involves negotiation of meaning and collective information exchanges.	• Team meetings • Project meetings
TRAN	**Participating in training** Involves skills development and empowering employees to do their jobs	• Workshops • Seminars • Short university courses
CMTY	**Membership in Communities of practice and networks** Provide a network of social contacts through which project team members source information relevant to their project work.	• Regional development forums with community organizations
TOUR	**Visits to field operations** Involves taking project staff out of the head office to interact with staff and clients in the field offices.	• Tours of project sites • Visits to field offices • Visits to beneficiary communities
EVAL	**Conducting project evaluation and reviews** Involves systematic evaluation of performance against intended objectives with the goal of identifying and capturing lessons learned.	• Project audits • Post-project reviews
MLRN	**Using learning facilitators**	• Project coordinator • Consultants • Project review facilitator

Codes	Categories and Descriptions	Examples
	Employee position that collects information, connects users, and coordinates the exchange of project knowledge.	
FDBK	**Managing stakeholder relationships** Ensures customer, clients, beneficiaries and all stakeholders are satisfied with the organization's products and services. Collects both volunteered and solicited feedback and reviews it for improvements	• Satisfaction surveys • Beneficiary or customer testimonials • Updates on project/program progress
DOCS	**Preparing project documents and reports** Provides an account of project and program activities and processes involved. Documents may also involve minutes of meetings or reports of reflective processes by individual employees (diaries) or project teams (project reviews)	• Project reports • Newsletters • Annual reports • Diaries • Order forms • Contracts with clients and or suppliers
STOR	**Using knowledge repositories** Systems and tool that enable the persistence of project/program records over time, so that they can be transmitted across time and space to other projects.	• Databases • Company server • Paper file cabinets • Project management office

Appendix A.7. Codes generated for learning barriers

Codes	Categories and Descriptions	Examples
Question 2.1 What are the perceived learning barriers?		
	People-centered barriers	
TIME	**Lack of time** Learning may fail because of a lack of time to engage in knowledge acquisition, retention and transfer activities.	• Busy work schedule with tight deadlines
TRST	**Lack of trust** Project team members may not feel confident to disclose or accept information from parties they don't know well	• Selective sharing of information
POWR	**Inequalities in power and status** Managers may not be receptive of ideas from individual project team members, who in turn, may not feel qualified to share their ideas	
	Organization-centered barriers	
CULT	**Organization culture** Refers to basic assumptions, values and norms that members of an organization apply in transferring knowledge from one project to others and across the wider organization.	• Organizational culture • Professional sub-cultures
STCR	**Work structure** Work structures may be informal and flexible or rigid and strict on which information is shared with whom and when	• Formal/informal
PRSS	**Inefficient organizational processes** Shortfalls in the organization's processes that affect the acquisition, retention, transfer and adaptation of lessons learned across projects	• Lack of formalized PPR process
RESR	**Insufficient funding** Limitations in availability of or access to resources (e.g., people, money) that facilitate learning	• Lack of funding

TECH	**Lack of supporting technologies** The absence of technologies to support sharing and transfer of project knowledge presents an impediment to learning	
PROJ	**Project characteristics** Refers to project-specific attributes which may interrupt the development of natural knowledge transfer paths and therefore impede project-based learning.	• Unique project tasks • Temporary nature
Knowledge type		
KNOW	**Knowledge type** Refers to the dimensions of tacit and explicit knowledge. Where explicit knowledge is easily codified and transferred while tacit knowledge is not.	• Tacit/Explicit
USE	**Knowledge transferability** Refers to one of a kind project knowledge that may be unusable or irrelevant in another context.	• Unique knowledge • Highly customized projects