A Study of Knowledge Management Challenges in Project Management: Case of Start-up Projects in Swedish Incubators

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ABSTRACT

The contemporary globalisation of economic activities has enormously accelerated the pace of innovation and technology development throughout the world. Continuous transformation of the marketplace and tremendous growth of demand on knowledge-intensive products and services has led to further evolution of knowledge management and project management studies. Increasing number of research done on knowledge management aspects within project environment evidences the expanding interest on the two areas of study. Incubators, representing the accumulators of knowledge management practices which facilitate the innovation and entrepreneurship through start-up projects, encompass vast number of issues for investigation related to the mentioned study areas. Past researches done in incubator field mainly concerned with the knowledge management aspects, neglecting the project management perspectives on it. Only few articles were found which refers to both fields of study within the incubators, although with an emphasis on project management models as catalysts of innovation.

Our research basically aims to explore, examine and illustrate both knowledge management and project management interrelationship, in the context of incubators. It provides with a conceptual model, which depicts the contribution and correlation of project management, organisational knowledge management and project specific knowledge management. Based on the observation and analysis of the empirical data collected using the IT knowledge-based risks model as our methodological framework, it was found that incubators do not share the same knowledge management challenges as IT companies. Combining the conceptual model derived from the findings of literature review, and the methodological framework, we developed a new model representing knowledge management challenges in the management of start-up projects within incubators. Out of ten challenges observed in the IT sector, our research finds eight main challenges in incubators that are related to knowledge management. According to the perceptions of the interviewees chosen from a sample of three incubators in Sweden, the main challenges are (i) handling business coach exit, (ii) communicating lessons learned, (iii) creating knowledge map, (iv) establishing knowledge network, (v) selecting appropriate team, (vi) storing knowledge from previous projects, (vii) integrating different expertise and (viii) transferring complete knowledge. Each of the mentioned challenges was placed in each of the three domains defined in the conceptual model, in order to accentuate the domain it directly affects or is mostly affected by.

Keywords: Knowledge management, project management, incubator, start-up project, project knowledge management.
DEDICATION

To my dearest mum and siblings, I love you very much! I look forward to seeing you soon.

Rosemary Otieno

To my dearest grandmother, who was impatiently waiting for me and worrying about my study during all these 17 months.

Ani Karapetyan
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CHAPTER 1: INTRODUCTION

The first chapter sets in motion the general introduction to the research study. After that, research objectives and research questions that guide the entire study are outlined. Next, it highlights the basic definitions of main concepts that are significant to the study. Finally, the chapter concludes by outlining the overall structure of the whole study.

1.1 General Introduction

As the contemporary economic and technological environment requires constant and rapid innovations implemented through projects, knowledge management (KM) has gained significant attention for successful project management (PM). Moreover, the main goal of PM has become to optimally combine the knowledge bases of team members and stakeholders in order to achieve business success. Past researches have shown that KM has increasingly become important to the success of organizations as it’s the source of innovations (e.g. Nonaka and Takeuchi, 1995; Davenport and Prusak 1998; Coulson-Thomas, 2004). Similarly, tacit knowledge has been linked to new product development, radical innovation and venture survival (Coulson-Thomas, 2004). Various types of knowledge are needed in different phases of start-up projects. For example, experience from previous project, skills of the project team, technological know-how and market knowledge are relevant for early phases, while knowledge about existing technical solutions, accumulated experiences and PM tools application are significant at the development phase (Saarenketo et al., 2009; Hanisch et al., 2009). However, as Bresnen et al., (2005) observed, little attention has been drawn towards exploring the challenges of managing knowledge in project environments, given that project knowledge resides within the project team and the project itself does not have an organizational memory as it tends to be temporary in nature. Typically, project organizations involve people with different backgrounds, experience, skills and knowledge who come together to achieve a common task (Fong, 2005). Thus, projects can be seen as “arenas for knowledge creation, integration, sharing, where new proven ideas and thoughts are combined” (Fong, 2005, p.106). The six respondents for this study have been provided by the business incubator industry in Umea, Sweden, where start-up project success is constrained by knowledge limitations rather than financial limitations (Collinson and Gregson, 2003).

In order to help us understand KM challenges in PM, the incubator firms were selected as the source of empirical data because they represent a set of projects (start-ups) requiring knowledge-intensive approach. Despite the high importance of both fields to the incubators, the area is still under-researched. The empirical questions for this study were drawn upon an IT knowledge-based risk model recently developed for a research work on ‘managing knowledge and learning in IT projects’. The research aimed to create a framework to map knowledge-based risks that are common to IT projects and provide practical guidelines and practices for the identified risks. Although the research examined the IT sector, this study exclusively explores the business incubator industry where KM challenges in PM have not been given much attention. As Sauer and Reich (2007) noted, the foundations of PM as a knowledge field remain under-researched, yet there is a growing trend and influences of PM against other management disciplines (Bredillet, 2007). Past researches conducted in incubators have focussed mainly on single disciplines, for example, knowledge management, innovation, entrepreneurial, amongst others.
Besides, incubators represent a big interest for knowledge management study, as they encompass vast fields of knowledge and diverse KM mechanisms that can be deployed in order to create, disseminate and utilise the appropriate knowledge and competence within the clients who wish to start a new business. The researchers were able to find only one previous study combining KM and PM in the incubator context, but mainly focused on the role of PM models as accelerators of innovation.

In order to support our study, the model developed by systematic literature review and practical exploration in IT projects by Reich (2007) is utilised as our methodological framework for collecting and analysing data. The model clearly links KM and PM, and also depicts the knowledge management challenges facing IT projects. Thus, the model provides a relevant basis for our empirical study. As the importance of knowledge is high in IT sector and Incubators, the verification and detection of knowledge-based challenges in both sectors represents a great value for the organisations and their clients. The investigation of the IT model within the incubator field will reveal similarities and differences of the project management approaches in these knowledge intensive industries, as well as will complement or modify the IT model providing a useful guidance for effective management of start-up projects in incubators.

1.2 Research Objectives

The aim of the study is to explore the knowledge management challenges in project management specifically in the case of start-up projects in Swedish incubators.

The key research objective has further been subdivided into three sub-objectives:
   i) To study KM challenges in project management
   ii) To validate the IT knowledge-based model in the incubator industry
   iii) To identify KM challenges in start-up projects in the incubators

1.3 Research Questions

In order to achieve the above stated key research objective, the main research question developed for the study is: What are the knowledge management challenges in project management particularly in the case of start-up projects in Swedish incubators?

The main research question has also been subdivided into three sub-research questions:
   i) What are the KM challenges in project management?
   ii) Does the IT knowledge-based model fit the incubator industry?
   iii) What are the KM challenges in start-up projects of the incubators?

1.4 Definition of Basic Concepts

This section explains some of the basic concepts that are important to our study. They set the foundations of our theoretical framework and empirical research. Several definitions are provided that will aid our study.

1.4.1 Knowledge

According to Saarenketo et al., (2009), knowledge is an ambiguous phenomenon and has a plethora of definitions. They view knowledge as a distinctive factor of production besides land, capital and labour; knowledge has a significant impact on productivity, innovation and product development. The distinctive nature of knowledge is also due to two aspects: tacit and explicit knowledge. Tacit knowledge is defined as informal skills
embedded in individuals which are difficult to articulate or transfer, while explicit knowledge are formal skills which can easily be communicated and transferred (Nonaka and Takeuchi, 1995). Other working definitions come from Davenport and Prusak (1998, p.5) who define knowledge as “a fluid mix of framed experience, values and contextual information” that provides a structure for assessing and integrating new experiences in the organization. Baker et al., (1997) defines knowledge as a set of skills, capabilities, experiences and information that individuals apply to solve problems.

1.4.2 Knowledge Management
Although KM has been defined in many different ways, the discussion on the concept of KM is still an ongoing process. Davenport and Prusak (1998) define KM as the way organizations construct and add knowledge to their routines and culture in order to increase efficiency. Baker et al., (1997) defines KM as a set of practices that organization applies to create, store, reuse and share knowledge. For the purpose of this research, these two working definitions are sufficient to aid our study.

1.4.3 Project
Project Management Institute (PMI, 2004, p.4) defines a project as “a temporary endeavour undertaken to create a unique product or service”. A temporary endeavour means that a project has defined goals, start date and end date. Early definition of projects comes from Gaddis (1959, cited in Soderlund, 2004, p.185) who defined a project as “an organizational unit dedicated to the attainment of a goal….generally the successful completion of a developmental product on time, within budget, and in conformance with predetermined performance specifications”.

1.4.4 Project Management
Project Management is defined as “the application of knowledge, skills, tools and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project” (PMI, 2004, p.6). Soderlund (2004, p.189) observes that most articles published in PM journals see project management as a “method for solving complex organizational problems”. He notes that such viewpoints weaken the underlying strengths of PM concept. Moreover, PM research has attracted cross-disciplinary interests from fields such as business administration, knowledge management, entrepreneurship, psychology, organizational theory, engineering and so on. This shows that PM has the potential to bring together different disciplines in order to focus on the important point of interest, that is, projects.

1.4.5 Project Knowledge Management
Project Knowledge Management (PKM) is the application of knowledge management in project environments and therefore, it is the link between the principles of knowledge management and project management (Hanisch et al., 2009).

1.4.6 Business Incubator
According to Branstad (2010, p.296) to incubate is to “contain something in a favourable environment for its appropriate development”. Thus, a business incubator is described as an entity composed of start-up projects that give forth new ventures by providing physical resources and support (Allen and McCluskey, 1990, cited in Branstad, 2010). Physical resources include office space, shared computing facilities, amongst others. Incubators also provide knowledge-based resources that are critical to project success, for instance, writing business plans, formulating business strategy, market research and networking with relevant industry partners. In addition, incubator
space provides a conducive environment for socializing and sharing of knowledge with other entrepreneurs.

The linkage between KM and PM as a source of competitive advantage has been stressed by many researchers. For example, Love et al., (2005) who set the basis for understanding KM in PM from their work on the ‘management of knowledge in project environments’ found out that through continuous innovation and new product development, managing knowledge can lead to project success given the current complex and dynamic business environment.

1.5 Significance of the Study

The study was developed out of the authors’ best knowledge that there are virtually no previous studies that have examined the knowledge management challenges in project management in particular, the case of start-up projects in Swedish incubators. This study therefore aims to contribute to literature by assessing how knowledge management in association with project management can aid to the success of start-up projects. The study also seeks to create awareness on the knowledge management challenges that affect business incubators. In addition, the study intends to develop a conceptual framework for the incubator industry based on the IT knowledge-based model. The new model will be validated using the empirical findings and literature reviewed and its relevance to the business incubators analyzed.

1.6 Organization of the Study

The study is organized into six main chapters as follows. **Chapter one** discusses the general introduction to the research study. It outlines the research objectives and research questions that the researchers aim to investigate. Then it briefly defines the basic concepts as used in the study. This is followed by identification of significance of the study. **Chapter two** introduces the main literature of the study. Foremost, the problem statement for the literature review is identified and knowledge gap stated. The historical development of the two main fields of study, that is, knowledge management (KM) and project management (PM) are traced. Next it discusses the theoretical perspectives of KM and PM as well as the models used in the two fields. Further linkage between KM and PM are identified according the literature. The last section discusses previous studies connecting KM and PM in the context of the incubators. **Chapter three** describes the research methodology. Both theoretical analysis and methodological framework are provided. First, the chapter discusses the methodological framework adopted for the empirical study. Then it analyses the research philosophies, research strategies and research designs that are relevant to the study. Similarly, research approaches and data collection methods are identified and discussed. The chapter ends with practical methodology where descriptions are provided on how primary data was obtained as well as ethical issues related to data collection. **Chapter Four** presents the empirical data and general findings. The first section discusses the background information of the six cases. The next section explains the results of the data and summarizes key arguments of the respondents on the KM challenges. **Chapter five** provides in-depth analysis of the findings. It discusses the three domains of the conceptual model in relation to the empirical findings. It further presents a new conceptual model developed from the field data and analyses the KM challenges. **Chapter six** summarizes the conclusions and recommendations for the study and identifies possible areas for further research. Figure 1 below shows the organization of the entire study.
Figure 1: Organization of the Study
CHAPTER 2: LITERATURE REVIEW

This chapter reviews relevant literature on knowledge management and project management. Elements such as knowledge, projects, KM and PM models, as well as incubators within two mentioned fields are discussed in the study. The chapter then introduces the reader to the research area and identifies the research problem for the literature review. Subsequently, it maps out the structure of the literature review then concludes with the conceptual model summarizing the main literature arguments.

2.1 Introduction to the research area

Although there are still on-going debates amongst researchers for a common definition of knowledge and knowledge management, Davenport and Prusak (1998, p.5) define knowledge as a “fluid mix of framed experience, values, contextual information and expert insight that provide a framework for evaluating and incorporating new experiences and information” while Knowledge Management (KM) is the “way organizations build, supplement and organize knowledge and routines around their activities and within their cultures and develop organizational efficiency by improving the use of employee skills”. Consequently, a project is defined as “a temporary endeavour undertaken to create a unique product or service”. Project Management (PM) is “the application of knowledge, skills, tools, and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project” (PMBOK Guide, 2004, p.4). Project Knowledge Management (PKM) is the application of knowledge management in project environments and therefore, it is the link between the principles of knowledge management and project management (Hanisch et al., 2009).

The modern knowledge management is attributed to early scholars such as Michael Polanyi (1958, 1966) and Ikujiro Nonaka (1991). The former distinguished between two different kinds of knowledge: tacit (personal) knowledge and explicit knowledge (Hill and von Ende, 1994), and the latter advocated for knowledge-creating companies using the successful Japanese business model in the 1980s. Tacit knowledge is described as informal skills possessed by individuals which are hard to articulate, whilst explicit knowledge is formal and systematic and can easily be communicated or shared. Gherardi (2006) states that the idea behind KM is that if organizations can induce their employees to store the knowledge that they produce while they work on projects and if they can draw on the knowledge stored by others, then a network will be created which will enable firms to work more efficiently.

2.2 Problem area for the literature review

The increased competitive economic environment is forcing organizations to continuously seek new ways to differentiate themselves from their competitors (Owen and Burstein, 2005). Many researchers (e.g. Nonaka, 1991; Davenport and Prusak, 1998; Owen and Burstein, 2005) suggest that one way of achieving this competitive edge is to develop knowledge management practices which will articulate how the organization creates, values, preserves and transfer critical knowledge to its operations. Hanisch et al., (2009) points out that there is a growing knowledge-intensity of work contents and an increased role of knowledge management services. As a result, the knowledge-based view of the firm considers knowledge to be firm-specific and the ability to assimilate tacit knowledge in the context of a common task execution is essential for competitive advantage (Grant, 1996). At the same time, organizations are increasingly using projects to create value and achieve business objectives. Similarly,
various forms of cooperation and working together are constantly growing (Hanisch et al., 2009). However, given that projects are temporary endeavours and unique in nature, they are considered to be different from the standard organizational processes. As Ajmal and Koskinen (2008) noted, the mounting complexity of project work means that an increasing number of technical and social relationships need to be taken into consideration in adapting knowledge and experiences from the daily work of an organization and from earlier projects. Therefore, management of knowledge in temporary organizations is seen to be vital competitive factor (ibid). In the two fields of study, that is, KM and PM, vast amount of research have been conducted from the perspective of specific disciplines or particular business formations but, not much theoretical and empirical work has been done to combine both areas and explore the management of knowledge in project environments (Love et al., 2005). Therefore, further insights are needed to help understand the linkages and contributions of knowledge management in project management. Thus, the research question developed to guide our literature review is: What are the knowledge management challenges in project management?

2.3 Method and procedure for the literature review

The fields of KM and PM are important in management literature and therefore there are enormous amount of publications in each discipline. We systematically conducted our literature review as suggested by Crossan and Apaydin (2010) in their work on “A Systematic Review of the Literature”. We gathered data from Umea University Library Business Source Premier, Heriot-Watt University Library Web of Knowledge, Google Scholar, Google Books and international journal websites like International Journal of Project Management (IJPM), Project Management Journal (PMJ), Journal of Knowledge Management (JKM), European Journal of Innovation Management (EJIM), amongst others. These secondary data were later filtered according to the area of our research problem. We also borrowed relevant text books from the University library and conducted searches on past dissertations related to our topic. Our supervisor also kindly assisted us with important reference materials to aid our study. We used explicit key words such as knowledge management, knowledge creation, knowledge integration, multidisciplinary project teams, temporary organizations, project-based learning, knowledge management models, project management, project management models, project management in incubators, knowledge management in incubators and so on.

2.4 Review of literature

We begin this section by presenting the historical development and theoretical perspectives of KM and PM. This is followed by a comprehensive description of KM and PM models. Afterwards the linkage between KM and PM is presented, as well as the previous studies done on KM and PM in the context of incubator projects. We conclude the chapter by summarizing the main findings into a conceptual model.
2.4.1 Historical development of Knowledge Management

While knowledge management field is still relatively new, the concept of knowledge can be traced back to the Greek Philosophers Plato and his student Aristotle that is, master-apprentice relationship (Awad and Ghaziri, 2008). In the early days, knowledge sharing and knowledge transfer were done through passing on of a family secret formula from one generation to another to make unique product. Thus, knowledge can be seen as a source of competitive advantage for many years. Michael Polanyi’s early publications on ‘personal knowledge: towards a post-critical philosophy’ in 1958 and ‘the tacit Domain’ in 1966 became the foundation of most works on modern knowledge management in 1990s (Grant, 2007). Another important development in knowledge management theory came from Ikujiro Nonaka with his work on ‘knowledge-creating companies’ in 1991 and later in 1995. Nonaka expanded Polanyi’s work on personal knowledge using cases from knowledge creating companies in Japan. He also developed the ‘knowledge creation model’ which states that successful innovations originate from converting organizational tacit knowledge to explicit knowledge and back again to tacit knowledge.

Other related developments in KM were presented by authors such as, Davenport and Prusak in 1998. They advocated for a clear distinction between data, information and knowledge in their seminal paper on working knowledge. They argued for a more holistic view of knowledge management from the socio-technical theory. However, they caution that their school of thought tend to be too prescriptive because it ignores the environment in which the organization operates (Grant, 1999).

The development of KM Taxonomy by Michael Earl in 2001 was another major achievement in the KM field. Earl identified three main KM schools which are the technocratic school, economic school and the behavioural school. The technocratic school is based on information and management technologies which support knowledge
workers (employees) in their everyday work. The economic school basically create revenue for the firm through exploitation of explicit knowledge, and other intangible assets like patents and copyrights. The behavioural school is more oriented towards the behavioural aspects of management which requires organizations to be proactive in creating, sharing and using knowledge.

In 2006, Gherardi observed two KM bodies of knowledge. The sociology of knowledge which argues that the conception of knowledge should be analyzed in terms of ‘social construction of reality’, while history of science teaches that “normal science does not become institutionalized by means of a process of accumulation and reflection on the knowledge produced, but through the mobilization of power resources in support of claims for its legitimacy and validity” (Gherardi, 2006, p.3). Below is a summary table of key development areas of KM.

Table 1: Summary of KM Historical Development

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<tr>
<th>Main Contributor</th>
<th>Area of KM Contribution</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michael Polanyi</td>
<td>• Personal Knowledge</td>
<td>1958, 1966</td>
</tr>
<tr>
<td></td>
<td>• Tacit Domain</td>
<td></td>
</tr>
<tr>
<td>Ikujiro Nonaka</td>
<td>• Knowledge Creating Companies</td>
<td>1991, 1995</td>
</tr>
<tr>
<td></td>
<td>• SECI Model</td>
<td></td>
</tr>
<tr>
<td>Robert Grant</td>
<td>• Knowledge-Based Theory of the Firm</td>
<td>1996</td>
</tr>
<tr>
<td>Davenport T.H. &amp; Prusak L.</td>
<td>• Working Knowledge</td>
<td>1998</td>
</tr>
<tr>
<td></td>
<td>• Socio-technical Theory</td>
<td></td>
</tr>
<tr>
<td>Michael Earl</td>
<td>• KM Taxonomy</td>
<td>2001</td>
</tr>
<tr>
<td>Susan Gherardi</td>
<td>• KM Bodies of Knowledge</td>
<td>2006</td>
</tr>
</tbody>
</table>

2.4.2 Theoretical Perspectives on Generations of Knowledge Management

It’s arguably said that KM has developed into three main generations. These three generations have different proponents and different views (Koenig, 2002; Snowden, 2002; Firestone and McElroy, 2002). The first view is accounted for by Koenig (2002) who states that the First generation KM was driven by information technology and other technological developments like the internet. This included adoption of best practices and knowledge sharing. In Koenig second theory, he views the Second generation KM to consist of people, learning and knowledge creation which he equated to tacit-explicit knowledge Domains. His last view on the Third generation KM emphasize on the management of knowledge through information technology. Koenig did not provide reference dates for clear distinction of the three KM generations.

The second view on KM generations is provided by Snowden (2002) who sees the First generation KM to be about information distribution to decision makers. His view implies that the information had been created at some point in the organization. He continued to observe that the Second generation KM was all about tacit and explicit knowledge conversion through the knowledge creation model developed by Nonaka in 1991. Snowden’s last theory on the Third generation KM is yet to be discussed but he says that it will view knowledge as a flow of information. Snowden, however, indicated the reference date for the Second KM generation, but not the First generation.
The third view was developed by Firestone and McElroy in 2002, although some of their views had been presented earlier by McElroy (2000) in his work on ‘The New Knowledge Management’. Their first view on the First generation KM is based on the ‘supply-side’, meaning there was an active participation by the knowledge suppliers and knowledge distributors. They note that the First generation KM was mainly composed of knowledge sharing activities. Secondly, they view the Second generation KM to have began in the mid 1990s and was focussed on both ‘supply-side’ or knowledge sharing and ‘demand-side’ or knowledge making. They point out that the defining characteristic of the Second generation KM was the “combined focus on knowledge integration and knowledge production” (Firestone and McElroy, 2002, p.2). Notably, however, Firestone and McElroy did not discuss or propose a third view on the Third generation KM. Also, they did not mention reference date for the First generation KM.

Based on the analysis of the proponents’ views, it is difficult to conclude whether KM theory is still in the Second generation or has moved onto the Third generation. Moreover, the lack of clear reference dates makes it hard to point neither the beginning nor the end of one generation from the other.

2.4.3 Historical development of Project management

Many researchers have previously traced project management roots to the development of project planning techniques such as the Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT) in 1950s and later, the introduction of Gantt chart by Henry Gantt in 1958. Ancient practices such as construction of the massive and mathematically-complex Egyptian pyramids have also been attributed to the early development of PM (Kwak, 2005). Similarly, Government Departments and Agencies such as the US Military and NASA have applied project management concepts for many years, for example, the Polaris project in 1950 and the Apollo project in 1960. According to Soderlund (2003, p.184), this historical advancement in PM tends to implicate that PM is “a specific problem-solving method of delimiting and grouping activities by using various types of techniques and methods”. Soderlund observes that project management research was therefore, closely linked to the optimization theory and applied mathematics which dominated part of the engineering schools’ curriculum.

Other project management researchers have offered different perspectives on PM development; for example, early contribution by Gaddis (1959, cited in Soderlund, 2003, p.184) recognized projects to be part of an organizational unit that is dedicated to the attainment of goals, hence he described project in the form of art and practice of management.

In 1976, the first body of project management was established in the United States by the Project Management Institute (PMI) PMBOK Guide. The PMBOK Guide has since been put forward as the guide to project management practices and emphasizes on time, cost and scope and the use of systems approach (Jugdev, 2004). Similar associations have been developed in different countries such as the International Project Management Association (IPMA), Association of Project Management (APM), amongst others. There has also been an upward growth of publications since 1990s showing the increased interest in PM from both practitioners and researchers from various disciplines. As Jugdev (2004) noted, the number of publications developed in 1960s through 1980s were mainly in the operations management which focused on computer applications and expert systems. In recent years, a number of project management related articles have focused on creating a new environment to enhance
business opportunities in the global markets. The table below summarizes major development in PM.

Table 2: Summary of PM Historical Development

<table>
<thead>
<tr>
<th>Main Contributor</th>
<th>Area of PM Contribution</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Military Department</td>
<td>Launch of Polaris Project</td>
<td>1950</td>
</tr>
<tr>
<td>Henry Gantt</td>
<td>Development of Gantt Chart</td>
<td>1958</td>
</tr>
<tr>
<td>Gaddis P.O.</td>
<td>Art &amp; Practice of Managing Projects</td>
<td>1959</td>
</tr>
<tr>
<td>NASA</td>
<td>Launch of Apollo Project</td>
<td>1960</td>
</tr>
<tr>
<td>Project Management Institute</td>
<td>1st PM Body established (PMBOK Guide)</td>
<td>1976</td>
</tr>
</tbody>
</table>

2.4.4 Theoretical schools of thought on Project Management

The nine schools of project management as proposed by Bredillet (2007, 2008) reflect the growing trends and influences of project management against other management disciplines. Bredillet points out that there is need to classify project management research trends so that the current developments in PM such as bodies of knowledge, certification programs and educational programs act as a source of value creation to the organization. He argues that fundamental development related to the theoretical perspectives supporting PM has not been explored. His view is supported by Sauer & Reich (2007) who state that the foundations of PM as a knowledge field remain under-researched.

All the different views of project management represent the heterogeneity of projects and the necessity of application of different tools and techniques. Depending on which school suits best to the project requirements, appropriate PM approach is chosen. The correspondent metaphors help to gain in-depth understanding of organisational and project needs (Bredillet, 2007). In case of organisational change, projects should be matched to new metaphors and new conceptual knowledge base should be applied. Each of these schools combines different perspectives of knowledge creation and knowledge use processes.

Table 3 below summarizes the major findings, the project metaphors, key ideas of each school, period of occurrence and unit of analysis of the nine schools of thought.
### Table 3: Summary of the nine schools of PM thought

<table>
<thead>
<tr>
<th>Schools</th>
<th>Metaphor</th>
<th>Key idea</th>
<th>Came to prominence</th>
<th>Key Unit of Analysis (Bredillet 2010)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimization</td>
<td>The Project as a Machine</td>
<td>analysis of project components, planning and scheduling them (Anbari et al., 2008); optimising the outcome of the project using math methods (Bredillet, 2010)</td>
<td>Late 1940s</td>
<td>Time</td>
</tr>
<tr>
<td>Modelling</td>
<td>The Project as a Mirror</td>
<td>organisational, behavioural and political issues as factors affecting projects; using hard and soft systems to model the projects (Bredillet, 2008c)</td>
<td>Hard systems: mid-1950s Soft systems: mid-1990s</td>
<td>Time, cost, performance, quality, risk, etc.</td>
</tr>
<tr>
<td>Governance</td>
<td>The Project as a Legal Entity</td>
<td>client-contractor relationships, transaction costs within the governance of projects, programs and portfolios (Anbari et al., 2008)</td>
<td>Contracts: early1970s Temporary organization, Governance: mid1990s</td>
<td>The project, its participants, and governance mechanisms</td>
</tr>
<tr>
<td>Behaviour</td>
<td>The Project as a Social System</td>
<td>leadership, communication, team building and HR management; as well as KM, virtual project teams, multicultural topics (Bredillet, 2008d)</td>
<td>OB: mid-1970s HRM: early-2000s</td>
<td>People and teams working on projects</td>
</tr>
<tr>
<td>Success</td>
<td>The Project as a Business Objective</td>
<td>project success factors, project success criteria, stakeholder satisfaction and project failure reasons (Bredillet, 2008d)</td>
<td>Mid-1980s</td>
<td>Success criteria and success factors</td>
</tr>
<tr>
<td>Decision</td>
<td>The Project as a Computer</td>
<td>information processing during the project life cycle, methods for realistic estimates of project cost and time (Bredillet, 2008e)</td>
<td>Late 1980s</td>
<td>Information on which decisions are made</td>
</tr>
<tr>
<td>Process</td>
<td>The Project as an Algorithm</td>
<td>finding the right path for fulfilment of the vision, analysing the ways of optimisation of the leading processes (Bredillet, 2008e)</td>
<td>Late 1980s</td>
<td>The project, its processes and sub-processes</td>
</tr>
<tr>
<td>Contingency</td>
<td>The Project as a Chameleon</td>
<td>distinguishing project types to adapt appropriate PM processes; aligning the capabilities with strategy (Anbari, et al., 2008)</td>
<td>Early 1990s</td>
<td>Factors that differentiate projects</td>
</tr>
<tr>
<td>Marketing</td>
<td>The Project as a Billboard</td>
<td>stakeholders’ need analysis, internal and external marketing of the projects (Anbari et al., 2008)</td>
<td>Stakeholders: mid-1990s Board: early 2000s</td>
<td>Stakeholders and their commitment to the project and project management</td>
</tr>
</tbody>
</table>

#### 2.4.5 Knowledge Management Models

KM literature is abundant with different interpretations of knowledge, information and data, as concepts. As a result many companies incur lots of expenditures on knowledge management technologies, which hardly provide with the needed outcome (Davenport, and Prusak, 1998). For further clarification, Argote et al., (2003) tried to structurize KM literature by dividing it into two parts: KM context and KM outcome. The latter implies knowledge creation, retention and transfer. The contextual part emphasizes more the units (individuals, groups or organisations), the relationship between them and the nature of the knowledge. Reich (2007) also mentioned about the separation of the KM literature into two groups: organisational learning and KM. In the first stream academics investigated the individual learning in the sense of spreading it into the team and overall organisation. The concepts, such as single-loop and double-loop learning, organisational memory and forgetting, system dynamics, were introduced here (Reich, 2007). Researchers of KM stream mainly focused on how knowledge is generated, transformed
and ultimately utilised. Most of the research is made on tacit knowledge issues, as well as on tools to support KM.

In the context of PM, there is a big challenge to handle the fast-paced growing demand and highly turbulent and complex environment. Hence “acting in complex situations involves “modelling to understand”, that is, to do ingeniously” (Le Moigne 2003, cited in Bredillet 2010, p.15). In the contemporary project environment the implementation goes simultaneously with the learning process, which includes gaining information, creation and sharing of tacit and explicit knowledge, identification of key units of analysis and parameters, as well as understanding of the context and relevant change conditions (Bredillet, 2010). Most of the models built for KM mainly focuses on one of the knowledge units, or the importance of the interconnections between them, as well as different facets of knowledge (Yang et al., 2009).

**Knowledge Creation Model**
The authors, Nonaka and Takeuchi, were the first ones who looked at knowledge in a more philosophical way. Pragmatic and technical considerations about KM were complemented by the need to understand what was happening with organisational knowing, reasoning and learning (Dalkir, 2005). They constructed a model which makes possible to ‘express inexpressible’ (Nonaka, 1991). The model describes the knowledge creation process in five steps – sharing tacit knowledge, creating concepts, justifying the concepts, building an archetype and cross-levelling the knowledge (Nonaka and Takeuchi, 1995; von Krogh et al., 2000). The model suggests that knowledge creation is a spiral process going from socialisation (direct experience) to externalisation (linking explicit knowledge), then to combination (learning by doing) and to internalisation (field building) - SECI process (Dalkir, 2005).

![Figure 3: Knowledge Conversion Processes](image)

Socialization (From Tacit to Tacit knowledge): Socialization is described as the process of sharing tacit knowledge with another person through direct experience (Nonaka, 1991). The direct experiences involve elements such as observation, imitation and practice. Fong (2005, p.46) notes that socialization is “a valuable mode of sharing knowledge in teams without language through imitation, observation and sharing experiences face to face.”

Externalization (From Tacit to Explicit knowledge): Externalization is the articulation of an individual tacit knowledge through dialogue and reflection. The conversion from tacit into explicit knowledge allows it to be shared with the team members (Nonaka, 1991). Fong (2005) states that the most frequently used tool in externalization is dialogue because it awakens the known and the unknown elements of knowledge.

Combination (From Explicit to Explicit knowledge): Combination involves mixing “discrete pieces of explicit knowledge into a new whole” (Nonaka, 1991, p.99). The new knowledge generated is as a result of synthesizing previously unconnected knowledge from different sources. New ways could also be developed to mix previously related knowledge. Fong (2005) describes combination in relation to knowledge integration, where knowledge is combined both within and outside the team to achieve a higher degree of knowledge diversity.

Internationalization (From Explicit to Tacit knowledge): Internationalization is the conversion of explicit knowledge into tacit knowledge, which is then used to expand an individual knowledge in the organization. Further, Nonaka and Takeuchi (1995) describe internalization as the process where new tacit knowledge is acquired in practice through learning.

There are also other prominent KM models such as Learning with Knowledge (LK) Cycle model, I-Space model, 4 I Framework for Learning and others, that are briefly described below.

The Wiig Model (for building and using knowledge)
Wiig KM model helps to apply appropriate approach of managing knowledge according to knowledge type. As Dalkir (2005) pointed out, the key principle of this model is that knowledge must be organised according to the following Domains: completeness (how much knowledge is available), connectedness (identified relations between knowledge objects), congruence (consistency of knowledge between objects) and perspective and purpose (knowledge from specific point of view or objectives).

According to the author, Wiig Model improves Nonaka’s SECI model, by proposing different levels of internalisation that are presented in the table below.
Table 4: Wiig Model - Degrees of Internalisation  
Source: Dalkir (2005, p.64)

<table>
<thead>
<tr>
<th>Level</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Novice</td>
<td>Barely aware or not aware of the knowledge and how it can be used</td>
</tr>
<tr>
<td>2</td>
<td>Beginner</td>
<td>Knows that the knowledge exists and where to get it but cannot reason with it</td>
</tr>
<tr>
<td>3</td>
<td>Competent</td>
<td>Knows about the knowledge, can use and reason with the knowledge given external knowledge bases such as documents and people to help.</td>
</tr>
<tr>
<td>4</td>
<td>Expert</td>
<td>Knows the knowledge, holds the knowledge in memory, understands where it applies, reasons with it without any outside help.</td>
</tr>
<tr>
<td>5</td>
<td>Master</td>
<td>Internalizes the knowledge fully, has a deep understanding with full integration into values, judgments, and consequences of using that knowledge.</td>
</tr>
</tbody>
</table>

The model also distinguished three types of knowledge: public (explicit and published), shared expertise (privately possessed and shared in the work) and personal (more complete and implicit, used unconsciously) (Dalkir, 2005).

**Learning with Knowledge Cycle model**

This model is widely used in the knowledge intensive companies where personal knowledge is encouraged to be expressed (articulated) and used according to others’ own knowledge base (internalisation) (Rowley, 2001). The author stated that this model captures social structure as well as the system view on the knowledge management process within the organisation. It also accentuates the interrelation of knowledge and learning. The model is represented in a cyclic way as the process constantly goes forth and back. Also, it’s applicable for tacit and explicit knowledge (Yang et al., 2009). Rowley (2001) pointed out following processes within the cycle:

![Image of Learning with Knowledge Cycle](source)

**Figure 4: The Learning with Knowledge Cycle**  
The I-Space model
This model provides with a mechanism to explain the knowledge creation within an information space (Yang et al., 2009). It also helps to understand how the knowledge is handled (Canals, 2002, cited in Casillas-Santillan, 2005). Boisot's I-Space model can be illustrated as a 3 Dimensional cube with the following Domains: (i) Codified-Uncodified, (ii) Abstract-Concrete and (iii) Diffused-Undiffused.

![I-Space Diagram]

Figure 5: The I-Space and Some Knowledge Assets (Blue Circles)

Yang et al., (2003) explains codification refers to how expressible the knowledge is through language or other tool. In case of non-codified knowledge the transfer depends on the inner abilities of the person (Yang et al, 2003). The abstraction according to the author depends on how observable the information is. And finally the third Domain, which is diffusion, is explained as the extent of the availability of the information within the group. In this way “any knowledge representation can be mapped inside the I-space through this system” (Boisot et al., 2000, cited in Casillas-Santillan, 2005, p.1).

In conclusion, it’s worth to say that most of the KM models are useful for broadening the understanding on KM processes and initiatives, as well as guiding in real life how to handle the KM challenges that might cause inefficiencies in the whole organisation.

2.4.6 Project Management Models
There is an extensive variety of project management methodologies represented in the literature. From the vast number of PM models we will summarise the ones that are mostly chosen by project managers when they have to face the challenge of deciding on how to approach each particular project.

Waterfall
The conventional and the most popular “waterfall” model used for about four decades represents a progression of project plan moving down (like a waterfall) through stages (stones) of a project  (Fox and Waldt, 2007). “At the end of each stage, the project moves through a gate, or review process, to the next phase (or from a pool of water down a waterfall to the next pool of water)” (Schoen et al., 2005, p.4). According to Fox and Waldt (2007) waterfall model is characterised by universal outline applicable for any kind of project and is widely used for the standard projects that are well-known for the team and do not require unique approach. In this model the activities are organised
using finish-to-start logic, where subsequent activity is started only when the previous one is finished (Perrin, 2008). The author also mentions that the critical feature of the model is that the project is not delivered to the client step by step. The client receives the final outcome of the project only when all the activities of the system are accomplished. Fox and Waldt (2007) represented the following main domains according to which the phases of waterfall model are separated:

![Figure 6: Waterfall model](source: Fox and Waldt (2007))

Forced by the needs of changing environment, pure “waterfall” model has gone through variety of modifications. Those include breaking down of the phases using the same judgment, but including slightly modified way of implementation. The phases could be broken down in exactly the same way, however they overlap or at a certain stage the project is divided into subprojects.

Taking into consideration its relative simplicity, structured and easily understandable phase distribution and other advantages, this model has major pitfall for handling many types of projects, which is its inflexibility. Guntamukkala et al. (2006) mentioned about no loops for feedback and low opportunity for changing customer requirements. Fox and Waldt (2007) noticed that the project within this model moves linearly through discrete stages of its life-cycle after ‘perfectly’ completing the previous phase, which in real life is not feasible. Perrin (2008) also stated that the model does not work well when the mistakes cannot be identified in the beginning and are costly to fix.

**Funnel model**
The other best-known PM tool is Funnel model created by K. Clark and S. Wheelwright around two decades ago. This model is widely used for new product development. Stamm (2008) pointed out that decisions within the model are made from a company-wide perspective not aimed to individual projects and are aligned to the corporate strategy. The shape of funnel indicates broader vision and not clear understanding at the early stages of the project life-cycle and incremental narrowing down towards clear business plan production at the final stage of the project (Orr, 2004).

Das (2002) described the funnel model applied in the ABB’s Research & Development organisation emphasizing following processes:
Stamm (2008) also mentioned that many academicians and practitioners argue that funnel model can be viewed as variation of the waterfall model but giving importance to generation of vast number of ideas and rapid filtering of them throughout the process of project progression. The main difference is also seen in the ambiguity of the final outcome of the project as in the initiation phase the requirements and the way project will be implemented are not clear.

**Spiral model**

Spiral model is also based on the waterfall model but is focused mostly on the risk mitigation (Fox and Waldt, 2007). It implies splitting the project into mini-projects, which are aimed to reduce the major risks identified in the project. Each subproject is addressed to one or more major risks and after mitigation of all risks only one or more additional subprojects are needed to accomplish overall project (Perrin, 2008). In that phase the project is run using the principles of Waterfall model (Fox and Waldt, 2007).

The authors determined the following six steps included in the cycles of spiral:
This model is more suitable for high-risk projects, as it allows undertaking risk mitigation cycles before applying the structured non-risk-based PM models (Fox & Waldt 2007). Schoen et al., (2005) argues that each cycle is similar to waterfall with its goals and clarity, though the final deliverable of the project is ambiguous, as the market requirements are hard to be identified in the early phases. He states that this model is well applied in the projects where market is important in defining the outcomes of development cycles. As it involves risk management, the needs of the customers are determined more clearly with each cycle and ultimately the final project deliverable is more aimed to meet the market requirements (Schoen et al., 2005). The key principle of this model is that before each iteration customers reasonably contribute to the formation of the next cycle.

**The Innovation Cycle**

Schoen et al., (2005), who analysed the project management models in the context of incubators, marked that conventional waterfall and funnel models do not consider the maturity of the company (start-up vs. established), as well as the potential need for business and technological support. Thus he proposed a new Innovation cycle model, which specifically encompasses the characteristics and the requirements of the technology oriented incubators. The model was based on the three identified steps of innovation: basic research, invention and innovation. Basic research assumed search of new knowledge, while invention meant developing the new knowledge or combining in a new way the existing knowledge in order to create new products and processes. The final step, innovation, was defined as “the initial commercialization of invention by producing and marketing a new good or service or by using a new method of production” (Grant, 2002, cited in Schoen et al., 2005, p.4).

![Figure 9: The Innovation Cycle](source:Schoen et al., (2005))

The proposed model takes into account the extensive time lag between the basic research and innovation (up to several decades) that are inherent to technological
incubators. As the author argues, it does not perceive the innovation as linear flow of knowledge through each phase. In contrast to the other three models neither the final outcome of the project is clear, nor the process of implementation of it, as it strongly depends on the market forces. The model clearly illustrates how the results of basic research become an innovative business idea. The knowledge development through combination of new and old knowledge might not evolve to innovation if it’s not incorporated into a business model. While going through illustrated tornados of invention, it’s clearly seen that technology drives the innovation process, however the market can pull it back, as the customers might not be ready to accept that innovation. That is why it’s important to consider the time in these kinds of projects.

2.4.7 The Connection between KM and PM

The link between KM and PM is often represented as KM in project environments (Lytras and Pouloudi, 2003). The authors describe the convergence of both areas as cognitive repetition of knowledge application in different configurations. Leuseure, and Brookes (2004) mentioned about kernel knowledge which is knowledge drawn from projects. Thus, from the perspective of project management, kernel knowledge management is essential in order to transfer knowledge within project teams or across them. They state that flaws in knowledge management result in useless activities within an organisation and low project performance. According to their empirical analysis, the main issue in knowledge management across the projects is construction of collective knowledge. Tacit knowledge management possessed by experts is also a critical challenge for the effective project management. Moreover, Reich (2007) identified ten main knowledge-based risks that might affect significantly project management. Some of them are: flaws in learning from past projects lessons, problems in integrating and transferring knowledge, lack of a knowledge map, and volatility in governance. In order to cope with those risks, Reich prescribed five knowledge-related initiatives: establish a learning climate, establish and maintain knowledge levels, create channels for knowledge flow and develop team memory and use the risk register.

Additionally, Lierni and Ribière (2008) examined specific KM practices that are mostly useful for the improvement of project management. They emphasized the need for organizations to have the “right knowledge” to the “right person(s)” at the “right time” in order to decrease project schedule and cost, to increase project quality. The authors stated “knowledge management enables a project team to reduce doing rework and compresses the time that it takes to plan projects” (Lierni and Ribière, 2008, p. 134). Knowledge management enhances communication within project team, resulting in a better understanding and sharing of project objectives. It provides with best practice awareness, lessons learned, project management methodologies and techniques (Liebowitz, and Mogbolugbe, 2003). Lesueur and Brookes (2004, p.115) also manifested that “KM and PM can only go hand in hand”.

Besides, “projects, whether or not we choose to think of them as temporary organisations, involve considerable knowledge processing” (Reich, 2007, p.6). Reich (2007) conducted an extensive research on knowledge-based risks in IT projects. She proposed to view a project from a knowledge lens. From that perspective a project meant to be a ground for knowledge creation, utilisation and sharing, where learning is critical for project performance and success. Initially, KM was studied in academic literature mainly in organisational context, emphasising the permanent organisational learning (Reich, 2007). As the author manifests there is a wide gap between extremely theoretical KM literature and more practical and non-conceptual PM literature. Thus,
Reich (2007) attempted to integrate all the main ideas from academic and practitioner literature on KM and PM and created a model. Knowledge is increasingly important and almost all aspects within the organisation can be explained in knowledge-based terms using knowledge management concept and models (Reich 2007). She constructed the model adopting the fundament for it from the three Domains suggested by Rosemann and Chan (2000, cited in Reich, 2007, p.7) for KM exploration in projects. She chose the system lifecycle approach leaving the other two; the knowledge lifecycle, and knowledge content taxonomy domains. Using IT framework input - process - output the researcher constructed the model initially called Knowledge Traps Model. It illustrates identified knowledge-based risks in IT projects and graphically depicts the places in IT project where knowledge and learning issues could impact the success of it. Later on, this model will be represented as our methodological framework for data collection.

“KM in the context of a project is the application of principles and processes designed to make relevant knowledge available to the project team. Effective KM facilitates the creation and integration of knowledge, minimizes knowledge losses, and fills knowledge gaps throughout the duration of the project” (Reich, 2007, p.8).

The correlation between the two study areas is not always seen as positive. There are number of theoretical articles and practitioners’ opinions that depict the conflicting aspects of the two fields. As the project management focuses on isolated temporary organisational objectives, mainly on a short-term basis, it can hinder the long-term vision of the knowledge management practices. The reason for that can be seen as, knowledge management leads more to realisation of overwhelming long-term goals of the entire organisation, and intervention of project based initiatives might disrupt the organisational knowledge management.

2.4.8 KM and PM in Incubators
Vast academic and practitioner literature review proved that there have not been conducted any synthetic research on identification of knowledge management challenges in the process of managing incubator projects. Moreover, the researchers only found a single article that discusses project management aspects in the context of managing knowledge in the incubators. Schoen et al., (2005) studied the project management models in the context of incubators, evaluating and suggesting the most appropriate and useful models for handling incubation projects. He focused his attention on the project management models as facilitators of innovation, defining them as mechanisms for knowledge flow. The conventional waterfall (stage-gate) (Figure 6, p.17), funnel (Figure 7, p.18) and spiral models (Figure 8, p.18) were criticised by him and new innovation cycle model (Figure 9, p.19) was proposed as the most relevant. Particularly he mentioned that most project management models offer a non-complete static graph to connect the incubation phases through “unidirectional flow of knowledge”, neglecting the time delays and other aspects inherent to these kind of projects (Schoen et al., 2005, p.4).

Extensive literature reviewed, as well as our own a-priori perception of the topic manifest that one of the main purposes of start-up projects held in incubators is to invest the relevant knowledge in their clients (entrepreneurs) in order to operate successfully in the marketplace. As Branstad (2010) stated in his paper, the responsibilities and challenges of incubators are centralised in giving access for entrepreneurs to the needed knowledge. Scillitoe and Chakrabarti (2010) also emphasized knowledge in defining the incubators as main source of social capital for incubates to offer their knowledge and
expertise, as well as network of contacts. Gassmann and Becker (2006) also studied knowledge aspects in incubators identifying two categories of knowledge transfer for venture projects- tangible and intangible. First one entails such materials as patents, databases as well as accounting, legal, market research and team building. Intangible knowledge is represented by advice, coaching for writing business plans, developing business strategies as well as establishing networks with related companies.

They even classified the incubators according to the knowledge modes used. Viewing the organisations from knowledge perspective, they distinguished four categories of mostly tacit knowledge in accordance to corporate incubator types: (i) Entrepreneurial knowledge flow is mostly needed in a fast-profit incubator, which is meant to offer funds for not used patents, (ii) organizational knowledge is important for a leveraging incubator, which commercialises the ventures based on the main technology of the parent company for further re-integration, (iii) technological knowledge flows mostly through an in-sourcing incubator, which focuses on obtaining ideas from external markets in order to be applied by the parent company and (iv) complementary market knowledge is utilised in a market incubator, which concentrates mainly on secondary technologies that might affect the market success of the core technology (Becker and Gassmann, 2006).

As overwhelming majority of venture companies hosted in incubators are mostly based on innovative ideas and require knowledge-intensive approach, we assume that knowledge has obtained central focus for start-up projects. Important characteristic of incubators is that the final outcome of venture projects is shaped overwhelmingly through knowledge management practices anticipating official and non-official procedures of knowledge transfer, explicit and tacit knowledge sharing, as well as creation of knowledge networks and establishing learning environment.

As it was postulated by Collinson and Gregson (2003, p.192) “start-up firms are arguably constrained far more by knowledge limitations than by financial limitations”. They mentioned that modern field of “knowledge management” studies contribute significantly in a better understanding of origins and development of ventures. Especially such knowledge management mechanisms as “knowledge-sharing” and “knowledge-integration” between and within the companies are considered to be very important aspects for having in-depth insight in the area of incubation projects. Hughes (2007) also focused his attention on knowledge and stated that these kinds of projects are basically aimed to solve the main challenge of new ventures: effective enlargement of the knowledge for intelligent competition.

Knowledge management is important for both sides, as according to Scillitoe and Chakrabarti (2010) incubators have to get in-depth understanding of the venture needs or technological difficulties, so that relevant knowledge or network of knowledge sources can be offered to maximise learning of technological, business and other skills. Aaboen (2009) noticed that the knowledge is possessed by both the business coaches and entrepreneurs and as incubators also get new knowledge with each project, the client structure or portfolio is of a great importance.

Vast theoretic and empirical studies are related to specific knowledge management practices such as knowledge sharing, knowledge co-production, integration and others. Knowledge sharing between entrepreneurs is also a significant aspect of knowledge
management within incubators. It’s insured and accelerated by providing the incumbents close localities within the incubator space and by creating favourable atmosphere for close interaction and sharing of knowledge as well as business contacts (Totterman and Sten, 2005, cited in Branstad, 2010). Westhead and Batstone (1998, cited in Aaboen 2009, p. 658) stated “the milieu as a whole that makes innovation happen rather than the individual firms”. Bergek and Norrman (2008) manifested that shared space used to situate the entrepreneurs provides with an advantage because of wider opportunities for knowledge and experience sharing. Inkpen and Tsang (2005, cited in Aaboen, 2009) also advocated the incubators’ acceleration of transferring tacit knowledge because of near allocation and open communication availability.

Knowledge co-production was also discussed in the literature; particularly Rice (2002, cited in Hughes, 2007) proposed a strategy for getting more benefits from the incubation. The idea was mainly to facilitate the collaboration between the entrepreneurs for initiation of new projects rather than merely sharing knowledge and experience.

Knowledge integration is also a significant component of KM. As start-up projects involve ample areas of human activities, extensive diversity of knowledge is anticipated and integrated into the client’s knowledge base. Collison (2000, cited in Collinson and Gregson, 2003) mentioned that ‘Integrative mechanisms’ are superior for combination of different knowledge sets from various knowledge networks to lead the incubation process.

As described above, incubation projects are strongly dependent on knowledge creation, sharing, integration and utilisation. In contrast to other regular commercial organisations, incubators are aiming to develop an appropriate knowledge foundation and knowledge network through each of its projects according to the needs of the entrepreneurs. Those projects are not managed in a regular way, as they are run in normal companies. The clients, in this case the entrepreneurs or venture companies, are responsible for further development of the project as they act and make decisions by themselves in accordance to the knowledge they gain throughout the whole time period of incubation project.

2.5 Propositions and conceptual model based on the literature findings

Based on our elaborate analysis of the above literature, we hereby summarize the main findings in Figure 10. As it was mentioned before in the contemporary economic environment, the success of the company is highly dependent on how it manages its knowledge. That is why knowledge management is highly important in the effective management of projects. The separation of organisational knowledge management, as practices used within the whole system and project specific knowledge management, as practices used particularly for the projects, aims to cover all the two conflicting views on project management and knowledge management linkage. In order to aggregate different aspects of correlation between the knowledge management and project management, we divided the areas of study into three parts: organisational knowledge management, project specific knowledge management and project management.
Organisational knowledge management represents the basic domain, which encompasses different databases, documentations and other knowledge repositories for distribution of explicit knowledge to the whole system. Human experts employed in the organisation also disseminate knowledge throughout the organisation contributing to overall knowledge potential. They have the most important role in sharing tacit knowledge.

The next and more specific domain is project management which is more focused on the group or team included in the project. From the perspective of knowledge-based approach, PM is aimed to combine and utilise both types of knowledge (explicit and tacit knowledge) optimally in order to create group knowledge and learning within the framework of projects. Consequently the knowledge management theories and practices derived from specific project environment, including new knowledge involved for accomplishment of project, specific knowledge management tools and techniques used only in the projects, represent the third domain of our conceptual model, that is, the project knowledge management.

From the illustration of the model it can be seen that all the three domains are correlated and contribute to each other. Project management is represented in the environment of organisational knowledge management and containing the project specific knowledge management. As overall KM identifies the potential of organisation to cope effectively with the new demands of the market, it identifies the way the projects are handled. The project management guide the knowledge flow within the project team and other external knowledge sources working for the project. So the project specific knowledge management in turn generate project inherent knowledge, which is focused on the defined objectives of the project. As any project creates new knowledge and contributes to the learning process of the whole organisation, project specific KM increases the overall organisational ability of managing knowledge, as well as projects. In this cyclic way all the domains mutually contribute to each other, having significant impact on the organisational performance and potential.
CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction
This chapter explores the key issues that are significant in the methodology chosen for our research. It begins by presenting and describing the methodological framework used for the empirical study. Then it uncovers the fundamental research philosophies relevant for the study. Next, it describes the research strategy and research design as shaped by the research question. Further, it details the research types and data collection method used for the study. After that the practical methodology is outlined. The chapter wrap ups by discussing the ethical issues related to data collection.

3.2 The Methodological Framework – Reich’s IT Knowledge-Based Risks Model
Reich’s model described in the literature review, depicting ten knowledge-based risks within the IT sector, represents the methodological framework and important research area of our study leading to the comparison of the challenges or risks faced within IT and incubation projects. Moreover, the model links knowledge management and project management, thereby providing a strong basis for the empirical study. All the questions of the interview will be dedicated to verification of each risk in order to validate or to create a new modified model representing the knowledge management challenges within incubation project environment.

![Diagram of Reich's IT Knowledge-Based Risks Model](image)

Figure 11: Knowledge-based risks in IT projects
Source: Reich (2007)
The brief description of each knowledge based risk in each phase will be presented below.

In the initiation phase, the author identified two knowledge-based risks.

1. **Lessons not learned from the previous projects**: Project-teams often involve individuals with no experience in similar projects to the one that is going to be started. Without this knowledge the team will not be aware of the risks of the initiated project, as well as will not be able to inform how these risks will affect the project performance.

2. **Team selection flawed**: All needed knowledge fields should be included in the project team. When the team is selected incongruously the project manager will not be able to identify the collective knowledge of the team and what it lacks.

In the governance of IT projects the author identified two main knowledge based risks concerning the key positions (project sponsor, project champion, steering committee).

3. **Volatility in the Governance Team**: The governance structure plays a significant role in knowledge-building procedure of the team. When one of the governance members leaves, project might lack important knowledge affecting overall objectives, targets and direction of the project.

4. **Lack of Role Knowledge among the Governance Team**: There is a risk that people coordinating the project from high level positions might lack some PM knowledge which will affect the performance of the project significantly. A newly involved project sponsor might be confused where to support the project and where to restrain. From the observation of the author, organisations do not usually train their executives as project sponsors or project champions which cause many difficulties for project manager.

In the operational process of IT projects the author identified five main knowledge based risks.

5. **Inadequate knowledge integration**: It was identified that integration of knowledge derived from different experts from various aspects of the organisation is critical for project success. Knowledge integration assumes creating a new idea and new knowledge which is bigger than the sum of the knowledge of its cross-functional members.

6. **Incomplete knowledge transfer**: There might be a conflict while transferring the knowledge from a vendor or consultant to the internal project members. The results of the research proved that capturing as much of intellectual property of vendors as possible, is important for the project success.

7. **Exit of team members**: Loss of a team member with a key expertise required for the project might cause wide gap of collective knowledge-base and critical disruptions in the project realisation. Long-term projects often face this challenge; however they often fail to develop some procedures to mitigate these kinds of problems (Reich 2007).

8. **Lack of Knowledge Map**: In order to make optimal decisions project managers and team members need thorough understanding of the knowledge within the team.
It’s especially crucial for large-scale complex projects to create a knowledge map encompassing the information who knows what, and what knowledge is reachable for each member.

9. Knowledge Loss between Phases: As in IT projects team members change from one phase to another, there might occur some flaws in transferring the knowledge to the next phase. As IT project often deals with artefacts, in some cases technicians or team members of the next stage miss the information why those artefacts are made in that specific way. As a result they might move on with a wrong interpretation of previous decisions made.

One of the most important knowledge based risks at the end of each project is considered to be failure to learn.

10. Failure to Learn: As the innovations and creativity plays significant role in the maintenance of the organisational competitive advantage, often lessons learned from a particular project does not represent as great value as overall competence of the project manager and organisation to realise projects effectively. Non-complete awareness of each project failure and success factors and unwillingness of the project manager to comprehend and transmit lessons learned, prevent the whole organisation and the team members to develop learning environment.

3.3 Research Philosophy

According to Bryman and Bell (2007) research philosophy provides the development of knowledge in a research field. Paradigm underlying the research methodology is estimated by many authors as more important than the methodology itself (Saunders et al., 2009). The paradigm representing the ways of developing and understanding the research philosophy is divided into two major branches: epistemology and ontology (Saunders et al., 2009).

Epistemology is defined as a “theory of knowledge that concerns the question of what is or should be regarded as acceptable knowledge in a discipline” (Bryman and Bell, 2007, p.16). Saunders et al., (2009) suggested 3 epistemological positions that determine the way knowledge is developed throughout the research process: positivism, realism and interpretivism. As it was observed by Saunders et al., (2009) most of the time research topic does not fit exactly into the frames of any single philosophy. However our choice of data collection methods and logic used to analyse them are mainly underpinned by interpretivist view on research proceeding. While positivism and realism represent simply scientific way of building up knowledge, coming up with generalised “law-like” rules, interpretivism is more linked to human values and is affected by the individual perceptions of the researcher and characterised by differences among people from whom the data was collected. As both domains of our study, KM and PM are constantly in the process of evolution and advancement, involving high level of complexity and social engagement, our study is focused mostly on the perceptions and awareness of humans performing in different social environments and dealing with various aspects of our research subject. Thus personal semi-structured interviews are considered to be most adequate and informative way of gathering data. Taking into consideration all the characteristics of our study described above, realism, assuming existence of the investigated subject independently from human mind cannot be compatible with our research philosophy. However our research methodology encompasses some principles of positivistic view on knowledge development, as it
builds up the content of our study from the theoretical model, already established in the discipline in order to validate or to modify it offering a new theoretical framework.

Ontology, representing the second major branch of research philosophy, captures broader considerations than epistemology (Saunders et al., 2009). The author describes it as “assumptions researchers have about the way the world operates and the commitment held to particular views” (Saunders et al., 2009, p.110). It covers two separate perspectives: objectivism and subjectivism. Objectivism postulates that “social entities exist in reality external to social actors”, while subjectivism considers the social phenomena as the result of perceptions. Even though the observed domains contain vast number of objectively existent components such as KM system, including the database, learning materials and other knowledge repositories as well as PM tools, such as software, prescribed duties and activities, our main subject of investigation deals with the “social phenomena” which is realised after human interaction within PM and KM practices and is not existent without the “social actors” (Saunders et al., 2007, p. 108). As our observed topic assumes continuous reconsideration and modification, like it’s described in subjectivism (Saunders et al., 2007, p. 108), due to specific reactions on the high turbulence of the marketplace and fast-paced development of technology, our research philosophy is proved to be based on subjectivist foundation.

To sum up, it’s worth to emphasise that from our epistemological and ontological position it can be clearly seen, the data collection methodology is raised on the philosophy which assumes revealing the substances related to individual values, perceptions, interactions and items that are not existent externally without humans.

3.4 Research Strategy

Two major research strategies are distinguished according to Bryman and Bell (2007), that is, quantitative and qualitative research. Quantitative research emphasizes the use of numerical in the collection and analysis of data, while qualitative research focuses on analysis of data based on words. The nature of this study, which involves individual perceptions on knowledge management and project management in the incubators, considers qualitative research strategy as the most appropriate technique for the empirical data collection. In addition, the study deals with issues like personal values, descriptions of relationships, communication, knowledge sharing and networking, which are not easily measurable and are closely associated with human involvement. Such kinds of elements are best retrieved from the source using personalized semi-structured interviews.

Our empirical research aim was to generate as much data as possible from the respondents using face to face interviews. Qualitative research is able to capture and generate a wide pool of data in order to draw on new insights. In this way, we are able to probe our respondents (where necessary) to provide elaborative answers to the interview questions. Since incubators are knowledge-intensive, getting information from the respondents requires intensive filtration and collection of the data. Qualitative research also provides a good tool for the empirical study because at the time of formulating the research question, the researchers did not have a clear picture of the research problem in a practical setting. Hence, there was the need to explore all relevant data that would support the research proceedings to complement the researchers’ initial understanding of KM and PM as reviewed from the literature.
The research strategy can also be distinguished in the following way: deductive and inductive. As our research subject focuses on verifying the existing theory created for one sector (IT companies) in another sector (incubators), the deductive approach was chosen to fulfil the objective of the study. However the inductive approach was also applied in order to generate a new theoretical framework that would be more suitable to the incubator industry than the IT knowledge-based model that we had adopted for the empirical studies.

3.5 Research Types

The purpose of this study was to examine knowledge management challenges in project management in particular, the management of start-up projects in the incubators. It also aimed at validating or developing a new conceptual model (based on the IT knowledge-based risks model) that would be appropriate for the incubator industry and reflect the critical areas of study derived from in-depth research of theory and empirical data. As a consequence of these research objectives, we chose descriptive type of study for further investigation of the general perceptions of knowledge management challenges in projects in order to expound on the management of start-up projects. In our study the clear picture of the problem was developed prior to collecting the data, the chosen research type therefore complies with the principles of descriptive study. Subsequently, based on the nature of our research subject, we aimed to develop clearer road map of the interaction between project team and entrepreneurs and how knowledge is transferred and managed in the incubators.

By adopting a descriptive study, we intended to conduct insightful interviews with six respondents from the three selected incubators in Umea. The interviews were conducted based on already identified ten KM challenges inherent to IT projects. The respondents were able to express different perspectives on the questions which were later discussed and analysed extensively. In addition, descriptive study provided an opportunity to expand the knowledge and the research area of related studies. Conversely, other two research types include exploratory study and explanatory study. Exploratory study assumes no opportunity for building a clear picture of the problem before collecting the empirical data, while explanatory study seeks to establish a causal relationship between variables (Saunders et al., 2009). However, these two research types were found not to be overwhelmingly appropriate for the study.

3.6 Research Design

There are several research designs which may be followed to conduct a research study (Bryman and Bell, 2007). Examples include case-study design, cross-sectional design, longitudinal design, comparative design and experimental design. As a qualitative study, the researchers selected a case-study design in order to obtain a detailed analysis of the case. As case-study design normally involves two types of approaches, single case-study and multiple case-studies (Saunders et al., 2009), for the research it was considered appropriate to adopt the latter approach in order to conduct an intensive and comparative analysis from a sample of six business coaches located in Umea. Respondents were drawn from the three incubators rather than from a single incubator. Conducting multiple case-studies enabled the researchers to identify the uniqueness and commonality across the perceptions of KM challenges in the three incubators. At the same time, the researchers gained an in-depth understanding of the theoretical manifestation on the data findings which were later analysed and conclusions drawn.
Other research designs mentioned earlier could not be applied to this study due to the research focus area.

3.7 Data Collection Methods

Due to the nature of the research subject, semi-structured interview was chosen as the data collection method. Compared to other interview methods, semi-structured interview offered flexibility for probing and asking follow-up questions to the respondents. There was lesser risk of missing data because the researchers were able to prompt where the questions were not clear or ambiguous to the respondents. The technique also allowed the researchers to tape the interviews to ensure that all relevant data were captured. Although there were minor setbacks associated with semi-structured interview, for example, time constraint could not allow the researchers to travel to major cities in Sweden (Stockholm, Gothenburg and Uppsala) to conduct interviews with business incubators located in those areas. Also, other data collection methods like questionnaires and observations, would not have provided immediate social interaction with the respondents; a knowledge facet that is very important in the incubators, and can best be achieved through face to face interviews.

3.8 Justification of the Sampling Size and Unit of Analysis

Although a larger sample size is encouraged in qualitative interviews to gain better precision (Bryman and Bell, 2007), the researchers used a smaller sample size (n=6). Since the study was descriptive, a smaller sample size was seen to be manageable to the researchers due to the time constraint. As a result, a total of six interviews were conducted and the unit of analysis was the individual incubator firm. In an attempt to ensure that the research questions were answered and the data was representative, the researchers selected two categories of respondents; the business coaches who were involved with the coaching activities of the start-up projects and the managers of funding projects concurrently working as business coaches, simultaneously coordinating and selecting all the projects.

3.9 Sampling Method

Several sampling techniques as identified by Saunders et al., (2009) exist. They include snowballing, quota and convenience sampling. In this study, both convenience sampling and quota sampling were applied. Convenience sampling was used because one of the incubators was located near Umea University, that was, at the University Science Park. This was advantageous to us in terms of minimal resource usage in accessing the first incubator for example time and transport cost. Similarly, snowballing sampling was used because when the researchers made their first contact with the third incubator, the respondent was kind enough to suggest to the researchers one contact from the second incubator. Later the suggested contact was made and interview time was agreed upon and arranged.

3.10 Description of the Principles of the Interview

A total of six interviews were conducted from three incubators in Umea (Uminova Innovation, BIC Factory and Krenova). Semi-structured face to face interview was adopted by the researchers because of its flexibility to allow for probing of the respondents. Usually, semi-structured interviews involve a list of questions categorized into various themes that may be altered depending on the context of the interview (Saunders et al., 2009).
Interview guide (Appendix 1, p.75) was developed based on the methodological framework provided on page 25 (Figure 11). It was divided into two sections; the first section contained the background information and second section contained the ten main questions. The questions were mostly open-ended to persuade the respondent to provide elaborative answers (Saunders et al., 2009). The questions were prepared in advance and sent to the respondent once the interview date was confirmed. The researchers also forwarded to the respondents the introductory letter (Appendix 2, p.77) briefly explaining the main purpose of the study.

The interviews began with the respondent providing his/her background and career profile. This was done in order to create a friendly environment and also to understand the respondent’s knowledge profile. Thereafter, the interview progressed into the main questions which were categorized into ten knowledge management challenges as adapted from the IT model. The conclusion of the interview was marked with two questions on knowledge management practices in the incubators. All the interviews were tape-recorded and took between 60mins and 90mins. However, while conducting interview 4, the researchers encountered technical problems with the tape recorder and the whole interview was not recorded. As a result, the researchers made handwritten notes immediately during and after the interview to capture the respondent’s responses and to ensure that no valuable information was lost. Below is the summary of the interviews that were conducted.

Table 5: Summary of Interviews

<table>
<thead>
<tr>
<th>Position</th>
<th>Incubator</th>
<th>Interview length</th>
<th>Interview Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Coach</td>
<td>Uminova Innovation</td>
<td>84 Minutes</td>
<td>29.11.2010</td>
</tr>
<tr>
<td>Project Manager-Business Coach</td>
<td></td>
<td>89 Minutes</td>
<td>03.12.2010</td>
</tr>
<tr>
<td>Business Coach</td>
<td>BIC Factory</td>
<td>64 Minutes</td>
<td>03.12.2010</td>
</tr>
<tr>
<td>Project Manager-Business Coach</td>
<td></td>
<td>66 Minutes</td>
<td>19.11.2010</td>
</tr>
<tr>
<td>Business Coach</td>
<td></td>
<td>65 Minutes</td>
<td>30.11.2010</td>
</tr>
<tr>
<td>Project Manager-Business Coach</td>
<td>Krenova</td>
<td>90 Minutes</td>
<td>25.11.2010</td>
</tr>
</tbody>
</table>

The selection of the six respondents was based on the fact that business coaches constantly interact with the start-up projects leading them from the early stages to business establishment stage. Business coaches provide coaching skills to the entrepreneurs while the project managers who also work concurrently as business coaches, head the incubators and provide management skills needed to coordinate the project activities. All the incubators represented organizations with flat structure, where the companies were headed either by the Chief Executive Officer (CEO) and then on the next level business coaches followed the hierarchy, or by the funding project managers working concurrently as business coaches.

3.11 Ethical Considerations

The importance of observing ethical issues in conducting research cannot be understated, as those people who the research will impact have the right to expect ethical honesty from the researcher (Saunders et al., 2009). In our study, the parties that are involved directly or indirectly include the incubators, respondents, institutions
engaged with the incubators, and other researchers who may wish to use the data generated from this study.

Saunders et al., (ibid) lists a number of ethical issues during data collection using interview-based techniques;

- Avoiding overzealous questions: Pushing your respondents to provide specific answers to your questions;
- Unreasonable interview time: Relates mostly to telephone interviews. Seek permission for appropriate time of the day which is convenient to your respondent;
- Demeaning questions: Avoid asking degrading or humiliating questions to your respondents.

Other general ethical principles to data collection include;

- Causing harm or intruding to respondent’s privacy: The researcher should avoid causing any harm to the respondents in case he declines to take part in the interview.
- Confidentiality and anonymity: Once permission is granted, the researchers should ensure that data collected from the field remains confidential and no personal information or sensitive company information is revealed.
- Objectivity: Avoid exercising subjectivity on the data gathered including fabrication of data.

*Ethical Issues considered in Our Study*

Before the face to face interviews were conducted, relevant permission to collect data was requested from each incubator with the respective respondent. This was done through phone call and email. Once the researchers and the respondent agreed on the time and date of the interview, background information to the research study and interview guide were forwarded to the respondent in advance. Before the start of the interview, the respondent was first briefed on the confidentiality issues regarding the study. Assurances were made to the respondent that his/her name will not be revealed and the data obtained from the interview will only be used for academic purposes. Further assurances were made concerning sensitive company data. The respondent was also informed prior to the interview the use of tape recorder and the treatment of the data acquired. In addition, there was no restriction on the use of incubators’ names as permission was requested and granted. Finally, the researchers wish to confirm that data collected throughout this study has been handled with much integrity and no manipulation or subjectivity has been intended whatsoever.
4.1 Introduction

This chapter presents the empirical findings of the study. The chapter is structured according to the interview questions developed from the methodological framework discussed in chapter three. First, description of the three incubators is provided. This is followed by a summary of the background information for the respondents. Thereafter the main arguments are presented and the final empirical results aggregated.

4.2 Description of the Incubators

Three business incubators were selected to explore the KM challenges in start-up projects; they include Uminova Innovation, BIC Factory and Krenova. The decision to choose the incubators as a source of empirical data was based on their unique features rather than their typical traits in terms of how they manage start-up projects. In addition, there has been little research undertaken in the incubator projects in relation to KM challenges. Uminova Innovation incubator was chosen because it’s the largest business incubator in Umea that deals with innovative ideas from university students and also located at the University Science Park. As for BIC Factory, it provides a strong foundation for start-up projects in their late stages of development, while Krenova deals with early project ideas from the creative field.

Incubator 1: UMINOVA Innovation

The first case was Uminova Innovation. Uminova as a ‘knowledge-hub’ consist of four companies: Uminova Innovation, Uminova Invest, Umea BioTech Incubator, and Uminova Science Park. Uminova is owned and funded by different partners in Umea. Our company of interest was Uminova Innovation which is a business incubator started in 2003. It has five divisions: Business Incubator, International Business, InfoTech Umea, BioTech Umea and Market Development. Uminova Innovation mission is to develop innovative project ideas into businesses. It works with ideas mainly from university students, researchers, university hospital, and research institutes in Umea. The incubator also receives innovative ideas from local companies based in Umea region. From 2004 to 2009, a total of 1096 new ideas have been accepted into the incubator, of which 190 have emerged as new companies, 78 as licence and cooperation agreements and 30 as patent applications.

Uminova Innovation has designed a four-phased process which all project ideas go through at the development process. The four phases include evaluation phase, verification phase, development phase and commercial phase. The first phase which is the evaluation phase assesses the suitability of the project idea by examining market opportunities as well as its strengths and weaknesses. The verification phase re-evaluates the strengths and weaknesses identified in the earlier phase. Business plans and short-term goals are developed here. Potential customers are also identified at this stage. The development phase offers a series of support services to the entrepreneur. At this stage, the entrepreneur redevelops the business plan, financial plan and marketing plan. Competencies for the entrepreneur’s advisory board are identified. The last phase, the commercial phase involves strengthening the start-up project. The entrepreneur applies for support funds, develop his team and look for clients. At the end of the incubation period, the entrepreneur is expected to leave the incubator and establish his
company. Currently, Uminova Innovation has a chief executive officer, 14 business coaches and a number of support staff.

**Incubator 2: BIC Factory**
The second case was BIC Factory. Business Innovation Centre (BIC) was established in 1998 as an independent business development centre in Umea. Since its inception, a total of 57 companies have been developed, of which 47 are still active in the market. BIC business concept is to provide an ongoing support to young entrepreneurs, promote the development of start-ups and provide entrepreneurs with access to business networks within Umea region as well as outside. The firm has three employees and two supporting members from the steering committee. The steering committees are formulated to assist the entrepreneurs’ to strengthen their start-ups. The staffs include project manager, business coach and administrator who provide business and management support to the start-up projects. BIC Factory focuses on developing ‘late’ start-up ideas, that is, projects whose ideas have already been developed into investment-ready business plans. Other elements like financial assistance and short term objectives have also been acquired or formulated by these start-ups. Hence, the start-up projects at BIC are regarded as mature compared to the other two incubators in our study.

Given that BIC deals with late start-up ideas, its projects do not go through the early phases of normal start-up projects. Nonetheless, the application process to join the incubator still exists. The project manager is in-charge of reviewing all applications before admitting any entrepreneur into the incubator. Submitted project ideas must comply with BIC requirements. This is followed by intensive interviews where successful entrepreneurs are invited to join the incubator for a maximum of two years. All the entrepreneurs work closely with the project manager and the business coach during the business incubation period. At the end of the two-year period, each start-project is evaluated and advice provided. Thereafter, a certificate of completion is issued to the entrepreneurs as ‘newly born stars’. Currently, there are 13 start-up projects ranging from game development, information technology, sales, design, communication, photography, environment, conference agent and estate agent.

**Incubator 3: KRENOVA**
The last case was Krenova. Krenova was established in 2008 as a business facility for helping entrepreneurs from the artistic industry. The main focus for Krenova is to develop start-up businesses in the creative industry around Umea. Krenova deals with early ideas that are yet to be translated into business plans. The ideas come from diverse field of creative art and design such as communication, film making, design, photography, and computer games. Most of the project ideas originate from art and design schools, technology schools and cultural practitioners in Umea. Krenova has a total of three staffs that include the project manager, communication officer and an advisory consultant.

The application process begins with an entrepreneur submitting his documents. This is followed by an extensive screening and evaluation of each project idea. At this point, the project ideas that proceed to the next step must meet three set criteria, otherwise they are dropped off. The three criteria include: first, the idea must be from the creative industry. Second, the entrepreneur must possess the right education background. Third, the entrepreneur must show the motivation to undertake the business challenge. The
successful entrepreneurs at this stage are invited for the interview where they explain their project concepts with the project selection team. Thereafter, each idea is re-screened by the project team to ensure that only the right project ideas pass through into the incubator. If selected, the entrepreneur joins Krenova to start the business development process. Krenova offers a maximum incubation period of one year, after which the entrepreneur decides either to venture into the market or join other incubator firms. Each start-up project is expected to manage itself after they have received the initial training and coaching. A family culture of open communication is embraced by all entrepreneurs. The entrepreneurs are encouraged to share knowledge and experiences, and motivate each other. Joint seminars and training programs are conducted for entrepreneurs. Business competition challenges are promoted for those who wish to participate. Currently, Krenova has 14 start-up projects, some of which are due to ‘graduate’ in January 2011.

4.3 Background Data

Six interviews were granted to the researchers at different periods. Before conducting any of the interviews, the researchers briefed the respondents the nature of the research both on phone and by email. Background documents for the interview were provided in advance to the respondents (Appendix 1 & 2, pp. 75-77). All the interviews were tape-recorded and transcripts produced with an exception of one interview that the tape recorder experienced a technical problem; however, handwritten notes were taken. Each interview lasted between 60 and 90 minutes and they took place at the respondents’ premises. Generally, the interview began with respondent explaining his/her education background, work experience, involvement with start-up projects, perception on knowledge and projects, as well as more specific description of the project team composition and processes involved. Further, the ten knowledge-based questions from the IT-model and as adapted to start-up projects were introduced and analyzed extensively.

The organisational hierarchy of the observed incubators were quite flat, as the staff of all the incubators consisted of mainly business coaches, some of whom were working concurrently as project leaders of financing projects. A total of six business coaches were interviewed, half whom were concurrently working as managers of funding projects, from three different incubators broken down as follows: three interviews from the first incubator (Uminova Innovation), two interviews from the second incubator (BIC Factory) and one from the third incubator (Krenova). All of the interviews were face to face and conducted in a semi-structured way. For the confidentiality purposes the real names of the respondents are not presented and are substituted with the fictive ones.

The table below summarizes the general profile of each incubator, the position of the respondents and their resource profile.
### Table 6: Summary of the background information on empirical data

<table>
<thead>
<tr>
<th>Incubator (I)</th>
<th>General profile of the company</th>
<th>Respondent</th>
<th>Case №</th>
<th>Position</th>
<th>General profile of the respondent</th>
</tr>
</thead>
</table>
| **I 1** Characteristics: For about 40 years the core of technological development and establishment of biotechnological cluster in the region  
Main staff: 14 business coaches and the CEO  
Start-up projects: Yearly around 150 projects mainly in life science, IT, healthcare, construction out which 30 companies are established | Adam | 1 | Business Coach-Administrator | Relevant work experience: 5 years  
Before was working as entrepreneur, marketing manager  
Education: Degree in occupational therapy & ergonomics |
| | Aron | 2 | Project manager-Business Coach | Relevant work experience: 22 years  
Education: Degree in Business administration |
| | Axel | 3 | Business Coach | |
| **I 2** Characteristics: Focus on late stages of formation of start-ups. Initiation of start-up projects with established entrepreneurial basis.  
Main staff: 1 project manager – business coach, 1 professional business coach-entrepreneur  
Start-up projects: yearly around 30 projects in design, IT, communication and other fields | Becka | 4 | Head of the incubator-Project Manager-Business Coach | Relevant work experience: 5 years  
Before was working as project manager for 10 years in media field  
Education: Degree in Media & Communication and Project Manager certification |
| | Britt | 5 | Business Coach-Entrepreneur | Relevant work experience: 6 years  
Before was working as entrepreneur for 25 years; Owns two small companies.  
Education: Bachelor of Arts; business coach training |
| **I 3** Characteristics: Focus on creative industry. Projects are handled from the earliest stages with people involved in the creative activities and having opportunity to commercialise them even without any entrepreneurial foundation.  
Main staff: 1 project manager – business coach, 1 marketing and finance specialist, 1 administrator  
Start-up projects: yearly around 15 projects mainly in art, web-design, and other fields | Clara | 6 | Head of the incubator-Project Manager-Business Coach | Relevant work experience: 3 years  
Before was working with start-ups as well in governmental organisation  
Education: Degree in communications and marketing |
4.4 Knowledge management challenges in the project environment

In this section we will briefly describe general insight of respondents concerning each challenge, after which we will summarise their main arguments in order to do the evaluation of the relevance of each challenge in the incubator field and its importance for the venture projects.

Challenge 1: Facing the risk of lessons not learned from the previous projects

1. Adam
Concerning the first challenge the respondent was asked to mention lessons he learned from previous projects. He could not mention something in particular but each time while handling the next project he improves the ability of identification of problematic areas within the project. He said “I can see better and better what is missing, e.g. this idea does not have the team, this entrepreneur does not have the time”. He specified that only in some areas the lessons not learnt from the previous project might have big impact on the overall success of the project. But in overall business, it’s more important to know that the market changes very fast, and the ideas 4-5 years ago like Facebook or Google business models, that could seem not working for all business coaches, might have great success in the nearest future.

2. Aron
The respondent mentioned that he cannot relay, store or preserve the knowledge from the previous projects and he is not sure if it can be valuable for 100%. He stated that, “as the environment is changing, we are shooting on the moving target all the time”. The main thing they bring to the next project is better understanding of how people think and work, which is mainly done by communicating and sharing insight on the outcome and the process of the project among other colleagues (business coaches).

3. Axel
The third respondent emphasised on the explicit knowledge that can be gained through each project, as he deals with variety of business ideas delivered from different fields of science. According to him lessons learned from previous projects obviously provides with an advantage. It helps to run the process of similar projects more smoothly, as he is aware of barriers and hurdles. He does not transfer the lessons learned on any paper material. Mostly experience is shared at that moment, making it available to all employees of the organisation. Usually there are some notes in the 7-Domain model (an internal model used to evaluate the feasibility of project ideas at the early stages), but they are confidential, and are not published. That template can be useful, as they can go back and see which questions were tricky and how were they solved. But the most important lessons are gained from communication in corridors or during other non official meetings, when they, business coaches, coach each other.

4. Becka
The respondent noted that she learns from past projects through recording and documenting project reports. Every three months she makes a report on each start-up project where some information about the lessons and challenges of the start-ups are highlighted.

5. Britt
The respondent stated that “…I learn all the time”. She acknowledged that the learning curve in this business industry is so quick and new things are happening all the time.
There is the old knowledge that she needs to teach the young people, for example how to be on time, how to treat other people and how to make a customer feel good. But there is also the new knowledge that is developing very fast. The respondent noted that she brings lessons learnt from the previous projects by using her past project experiences and listening to what others say. However, she finds it difficult to pinpoint the things she can perform within the next few months because there is constant change of events in the incubator industry. Otherwise, they often documents the main issues learnt from the previous projects.

6. Clara
The respondent noted that she learns many new things from projects all the time. Every person and project is different and the entrepreneurs bring new experiences, motivation, and backgrounds. She also learns a lot from colleagues and other entrepreneurs. She went on and said, “the main thing that I have learnt is to be open…I have learnt how to sit down and be completely blank and put all my prejudice behind me and listen and give everyone a fair chance. It’s very easy to judge….I have learnt not to judge or think that my way of thinking is the right way or even the opposite way can be your right way and I do not hold the truth and it’s never black or white and I do not think that I was aware of that at the beginning but now I get more flexible”. The respondent acknowledged that it’s rather difficult to pinpoint specific lessons she has learnt from previous projects as everything is in her head and nothing is recorded.

Table 7: Main arguments on Challenge 1 and relevance evaluation

<table>
<thead>
<tr>
<th>Case №</th>
<th>Main arguments</th>
<th>Evaluation (importance, relevance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The market is changing rapidly and the business knowledge gained through previous projects might not be viable for the next ones. Even though in cases of the knowledge intensive and deeply scientific project, it might affect the success of the project.</td>
<td>high medium low</td>
</tr>
<tr>
<td>2</td>
<td>The environment is constantly changing and each project is aiming to reach the target. However, communication between colleagues about the lessons learned is the main part of the organisational culture in the incubator 1.</td>
<td>high medium low</td>
</tr>
<tr>
<td>3</td>
<td>Lessons learned through dealing with different scientific areas and different obstacles of specific project types, provides with an advantage.</td>
<td>high medium low</td>
</tr>
<tr>
<td>4</td>
<td>The lessons learned are important and are highlighted in documents of each start-up project report.</td>
<td>high medium low</td>
</tr>
<tr>
<td>5</td>
<td>As in the business new things are happening all the time, new knowledge should always be gained and developed. Lessons learned from the past are also useful for being able to understand and listen to what entrepreneur says.</td>
<td>high medium low</td>
</tr>
<tr>
<td>6</td>
<td>Lessons learned from previous projects involve mainly the tacit knowledge of being open without prejudice, as every project is different and each time you deal with new experiences, motivations, and backgrounds.</td>
<td>high medium low</td>
</tr>
</tbody>
</table>
Challenge 2: Facing the risk of team selection flawed

1. Adam
   The respondent stated that as the incubator has 14 business coaches specialised in different areas of science, as well as experts in general business knowledge, it’s always good to mix them together for each project, as the people from different fields might answer the questions that one might not know. Nevertheless, during the business coach meetings, newly entered ideas are often given to business coaches with related or same background. If there are areas that might not be understandable the other business coach can join the project team on the part-time basis. Every business coach has contacts and networks in their area of work. The incubator also has 3 internal consultants to help out.

2. Aron
   To the question about team selection and team composition the respondent replied that in the selection process the researcher has the last word and they select which expertise to involve in the project. Most of the cases the inventors or researchers are very aware of the areas that they have to use as external competence. The team is usually complemented by experts in sales, in order to sell the project. The salesman-entrepreneur is the general lack that they have within the team. The respondent didn’t mention any challenges that might arise from inconsistent team selection, as the selection exists only for relevant business coaches and consultants. The business coaches are selected during the meetings according to their area of expertise and the development route of the start-up (international arena or domestic).

3. Axel
   The third respondent from the first incubator also pointed out that they hold regular business coach meetings, where the incoming business ideas are presented and allocated to suitable business coaches. He described that mainly two business coaches decide if the business idea should be selected or not. Later other colleagues can give their opinion and arguments if they think business idea should be left out. Then they have discussion for final decision. At the business coach meeting they assign one or two business coach to particular project. Then it’s decided who will be the head coach, who will start with the first introduction of 7-D Model and later on it is decided if other persons should be involved in the project. The incorrect selection of team members might affect the project performance, mainly causing loss of time. It happens usually when a new consultant is included for providing service. Nonetheless, in this case any non-qualified team member is replaced straight away.

4. Becka
   Regarding the question about team selection and the typical expertise involved in a start-up project the respondent from the second incubator replied that the projects do not have specific team assigned to them as there is a small number of staff at the incubator. Nevertheless, the entrepreneurs are supposed to manage themselves. There is a steering committee that assists the staff to provide support to the start-up companies. Core competencies of the project staff range from marketing, arts, media and communications coupled with many years of experience in dealing with start-up projects. Therefore, the selection process for main members of the project team does not exist, although the entrepreneurs’ advisory board is selective. Often it consists of ‘graduate companies’ of the incubator. The respondent gave greater importance to selection of entrepreneurs and overall project portfolio.
5. Britt
Elaboration on the question about typical expertise involved in a start-up project and the process used to select team members started with description of the project board (team) consisting of two or three entrepreneur’s board. The Incubator 2 project board works like an ordinary board but with no economic responsibility. Usually the entrepreneur’s board is composed of team members from the same field whose function is to help the entrepreneur strengthen his start-up company especially weak areas, for example sales or marketing. Thus the teams are very personalized to the entrepreneurs needs. Regarding selection of team members to the entrepreneur’s board, the incubator staffs occasionally recommend to the entrepreneurs a team of experts but most often the entrepreneurs are encouraged to make their own “Dream Board”.

6. Clara
The respondent described the field of competence for each of the three staff at the third incubator. The respondent is in charge of managing the activities of the entire company, concurrently being the business coach. Then they have an advisory consultant who advices the entrepreneurs on financial matters and the communication officer who is in-charge of administration and provision of technical support to the entrepreneurs. She acknowledged that the harder part for the entrepreneurs is to get the network and to find the people who will buy their services. However, due to the small number of staff at the incubator, there are no specific team members assigned to individual start-up project. As a consequence, staffs provide support to all entrepreneurs.

Table 8: Main arguments on Challenge 2 and relevance evaluation

<table>
<thead>
<tr>
<th>Case №</th>
<th>Main arguments</th>
<th>Evaluation (importance, relevance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>As new people with relevant knowledge might enter the project when it’s needed and each business coach has wide network of knowledge resources, the team inconsistency is not crucial. Though in the beginning the project manager (business coach) tend to be selected according to relevant expertise.</td>
<td>high medium low</td>
</tr>
<tr>
<td>2</td>
<td>Entrepreneurs in this case the clients of the incubator are very important in the selection process of the team. As most of them are well-aware of the expertise needed The task of the business coach is providing appropriate knowledge or people who have it, using large network of contacts.</td>
<td>high medium low</td>
</tr>
<tr>
<td>3</td>
<td>The flawed team selection might have impact on the project in terms of losing time, although the incompetent consultant or other member can be substituted at any time of the project.</td>
<td>high medium low</td>
</tr>
<tr>
<td>4</td>
<td>As the three employees of the second incubator deal with all projects, the selection process of main team members does not exist, although the advisory board which support the entrepreneur is selected.</td>
<td>high medium low</td>
</tr>
<tr>
<td>5</td>
<td>It can be assumed from the perception of the second respondent of Incubator 2 that the team selection has somewhat importance, as it’s personalised according to each entrepreneur and are recommended to be from the same area, so that the weak areas of project will be strengthened.</td>
<td>high medium low</td>
</tr>
<tr>
<td>6</td>
<td>All three staff members are involved in all start-up projects of incubator; consequently the team-selection problem does not occur in this incubator.</td>
<td>high medium low</td>
</tr>
</tbody>
</table>
Challenge 3 and 7: Facing the risks of Volatility in the Governance Team and Exit of the Team Member

1. Adam
The respondent firstly was asked about the existence of governance structure in the incubator. He classified the organisational structure of the incubator as quite flat, as the top management is represented only by CEO and the rest of the employees are business coaches. The incubator is supported by different organizations, so if they need more human capital or scientists in the future, they put money and direct the incubator in a certain way. The incubator has lots of small projects related to the funds for whole organisation. They are not all start-up projects and are not linked to business coaching. So the work of the project leaders of funding projects is separate from the work of project managers of start-up projects (business coaches). While the funding projects have their governance, represented by Swedish Government, Umea County, and other financiers, the start-up projects are governed only by business coaches. Thus, the main question about the problems that might arise due to the volatility in the governance team, concerns only to the business coaches. Even though business coaches are sometimes replaced by the new ones, there is only loss of time and relationship with clients. Especially when the experienced business coach leaves the project there might emerge a knowledge gap but hopefully it’s accumulated in the clients in order to be able to manage themselves. The knowledge gap is also managed by sharing the knowledge in advance with other colleagues before a team member’s exit.

2. Aron
To the question about the governance structure of the projects, the respondent approached it from the perspective of financing projects, as he works as project manager of financing projects. He mentioned that they mainly report to financiers who provide about 20% of the funds and the other 80% are provided by co-financiers that are searched within Sweden and Europe. As the first business coach of the same incubator, he stated that the start-up projects are not monitored by the financiers. So the main challenge to be faced is the volatility in the business coach team. He mentioned that during the last years they lost lots of competences due to team members leaving the incubator, although new employees brought fresh ideas, which were also useful.

3. Axel
He also pointed that there is no correlation between the governance board of the company and the start-up projects. The only challenge that might occur concerns the exit of business coaches. He sees that there is a big challenge when the head coach leaves the project, especially if he has followed the project for a long time, then he has the whole picture and know what has been done right or wrong. Moreover, the business coach has already established personal relationship and trust with the client. That kind of knowledge and experience are hard to transfer to the next coach taking over the project. The effective way of managing this kind of issue is working in parallel for a couple of months before the person leaves. It will build up personal relationship, even though all the business coaches know almost all of the incubates except the ones that are located in the other area, or in the research park.

4. Becka
The respondent was also asked about the governance structure for each start-up project. She said that there are two project bodies that are involved in providing support to the incubator. The first is the governing board that governs the company (i.e. incubator 2)
and the second is the steering committee who advises the entrepreneurs on their projects. The two boards do not meet face to face as their functions and responsibilities are quite different. Since the governing board was formed, only two members have left the board and have since been replaced. The respondent acknowledged that there was knowledge loss when the board member left but it did not affect the performance of start-up projects. As the employees consists of two business coaches, if one of them leaves the company the learning and knowledge sharing environment will be changed, causing some disruptions in the projects.

5. Britt
The respondent discussed extensively the “governance structure” of each start-up project at the second incubator. The respondent recognized that each project does not have a formal governing board but an advisory board. This is because the incubator has mature entrepreneurs who know what they want and therefore do not need a body to supervise them. However, the incubator as a “project” has a governing board who receives feedback on the incubator’s overall performance. The incubator’s governing board do not provide financial support to the individual start-up projects nor do they monitor incubator’s internal activities. The researchers received a surprise response from the respondent when they asked her how the exit of business coach is handled. The respondent calmly replied “In fact, am leaving....this is my last month”. She stated that over the last two months she has been reporting all her activities to the project manager and project assistant so that they are updated on the processes. She was also constantly been teaching and briefing the project assistant how she does things before a new business coach is employed. As a means to ensure all the important knowledge is transferred, the respondent has made arrangements with the incubator to come back often and help where necessary until the vacuum she will leave is filled. However, she acknowledged that it’s not possible to transfer all her competences to her successor; for example, the coaching skills that she has developed over the years are difficult to articulate. Similarly, her entrepreneurial mindset cannot be understated given that she has been running her own company since 1996, which has provided her with a wealth of experience on running start-ups. The respondent expressed an idea of having a board of business coaches working as consultants and not employed by the incubator on a full-time basis. This would ensure more effective way of running the projects.

6. Clara
According to the respondent the governance board that exists governs the incubator and not the start-up projects. The governance board consist of company owners and funding partners and each partner is represented in the board with an exception of European Union. They hold frequent meetings at least five times a year where the project manager presents facts and figures about the start-ups. Otherwise, the governing board has no influence on the running of the start-up projects. The respondent noted that there had been a change of manager in the past and it was not easy dealing with it because of the accumulated knowledge that was lost. In addition, the respondent was new to her job which coincided with the old employee leaving the company. As she narrates, “it was a big problem when she left. She had been working here since 2008, so she was the one that knew everything. And the knowledge, experience that she had, of course, was lost. So I panicked for a while then I decided I couldn’t panic anymore because we had to get going”. During the first period she struggled, though after a while she managed to put everything in order and to handle the ongoing projects. She stated that the best way to manage the knowledge gap created by a team member who left would be to develop a good database where important information is kept.
Table 9: Main arguments on Challenge 3 and 7, relevance evaluation

<table>
<thead>
<tr>
<th>Case №</th>
<th>Main arguments</th>
<th>Evaluation (importance, relevance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>As the individual project is governed only by the business coach, in case of his exit from the project, which means from the company, the new business coach is employed. The progress of the project is affected in terms of time for building relationship and filling the knowledge gap.</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>2</td>
<td>The main challenge to be faced is the volatility in the business coach team. The rich experience showed that they lose lots of competences; however the new personnel bring new approaches and fresh ideas.</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>3</td>
<td>The business coach has the whole picture and knows what has been done right or wrong. The knowledge gained from establishing personal relationships are hard to transfer to the next coach taking over the project.</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>4</td>
<td>As the company is represented and run by the respondent since its formation, the volatility within the direct project governance was not experienced. As the environment established in the incubator is very important, the exit of one of the two business coach might have big effect.</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>5</td>
<td>No need of full time employment of business coaches within this incubator. There should be a board of them, who will be hired as consultants according to the needs of the project. Nonetheless the unique entrepreneurial knowledge possessed by the business coach who left, is sometimes hard to be replaced, as it’s not acquirable.</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>6</td>
<td>The change of the main project manager, concurrently the business coach caused many problems mainly on the organisational level, though the start-up projects after a period of time were handled successfully.</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
</tbody>
</table>

Challenge 4: Facing the risk of Lack of Role Knowledge among the Governance Team

1. Adam
The respondent noted that he has occasionally observed lack of project knowledge in the governance team, but in overall the governance team has a broad-spectrum of the activities for the projects they fund. In general the funding partners want big companies, and yet 90% of companies in Sweden are still small for example. In the respondent’s case, the government that provides funds for the projects set up goals and make programmes, but those goals do not affect the individual projects.

2. Aron
As the organisation is quite flat and governance team does not have impact on each project, this issue is not important for the company.

3. Axel
All the projects have different financial structures with co-financing by the funds from municipality, county council, university and others. They put the money so they have decision whether to cut down the projects or to start with the new financing projects. Some of the business coaches are also assigned to be the financial project managers. For his part of international business development there are two projects managers. But the
responsibilities are separated and are not linked. He thinks that co-financers or EU administration might lack some flexibility in gaining new knowledge, as they have quite hard administration burden and bureaucracy. Nonetheless as they do not have impact on the start-up projects, their lack of role knowledge do not cause any direct trouble.

4. Becka
In relation to PM knowledge among the governance team, the respondent noted that the governing board members are aware of their roles pertaining to governance issues for the incubator. According to the respondent, most board members have strong competence in project management skills because majority have PM certifications. Therefore, the PM skills supplement well with the incubator activities of developing start-up projects and therefore additional training in PM may not be necessary. However, in order to fulfill the incubator’s future objectives of working with environmental start-ups, the governing board will need some new members who have expertise in the environmental field. But as the steering board do not interfere in the process of start-up projects, the mentioned challenge is not relevant.

5. Britt
The respondent acknowledged that since she does not interact often with the incubator’s governing board, she was not in a position to comment whether the governing board lacks PM knowledge. But she stressed that since the board does not have direct influence nor participate in the management of the start-up projects, inadequate PM skills amongst the board members would have no effect on the success of the incubator’s start-up projects.

6. Clara
In the case of the third incubator the respondent answered the same way as the previous respondents.

Table 10: Main arguments on Challenge 4 and relevance evaluation

<table>
<thead>
<tr>
<th>Case №</th>
<th>Main arguments</th>
<th>Evaluation (importance, relevance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>As the governance structure of the companies do not interfere with the individual projects, the lack of role knowledge among the governance team has no importance and is not relevant in the case of incubators.</td>
<td>high</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>medium</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td></td>
<td></td>
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<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Challenge 5: Facing the risk of inadequate knowledge integration

1. Adam
To the question about knowledge integration using any PM tools or techniques, the respondent replied that they have several tools for effective integration of many diverse expertises within the project team. For example in order to help the researchers to write the business plan, he uses specific checklist designed for this purpose. There is also a manual on how to relate to his questions and intranet to get all the information. Some of their clients use PM software but the main tool used by them is 7-D model, which depicts all the missing knowledge areas for effective knowledge integration. This model was originally developed in London business School, but they adapted it to their organisation, afterwards to UMEA region.
2. Aron
From the point of view of the second respondent the inadequate knowledge integration might occur when there is no chemistry, networking, relationships, and other not official techniques. But the main tool is 7-D Model used to map the lack of knowledge.

3. Axel
In order to have adequate knowledge integration the third respondent tried to highlight all the questions concerning starting up a new business. When new people from different cultures, different experience, institutes and faculties come to them, they try on early stages projects to focus on different business parts and try to have teacher’s role using the white board trying to explain the basics of marketing, client satisfaction, SWOT analysis, etc. He also mentioned the 7-D model and the database where they store all the information about the business ideas and entrepreneurs.

4. Becka
The respondent emphasised on open communication between all the entrepreneurs and the business coaches, where they share the knowledge and gain knowledge, create new ideas, initiate new projects by collaboration, etc. That is why during the selection of the entrepreneurs that are going to be hosted in the incubator, the respondent (head of the incubator) verifies how can the new member contribute to the learning and open environment and affective knowledge integration.

5. Britt
In the first period the client is asked to construct his ‘dream-board’, who will help him to identify the knowledge areas that are missing. With regard to the PM tools application, the respondent mostly uses her business coaching models like mind-mapping tools to coordinate her work. She also supplements her vast coaching knowledge with contacts within her network. She assists entrepreneurs to set up the overarching long term goals that are supported by a number of short term goals. The short terms goals are revised depending on the market response and future focus. The respondent noted that some of the entrepreneurs use risk management tools to analyse the market, manage time and customers. The respondent said by adopting risk management tools and goal-setting, she is able to integrate entrepreneurs’ knowledge and business knowledge and therefore, the tools she uses depend on the problem at hand. On the other hand clients sometimes are too busy with their routine work, such that they might skip very important seminar or discussion, which would be very valuable for them. Ultimately they decide whether to get the support from her or not.

6. Clara
Concerning PM tools application, the respondent acknowledged that she doesn’t use PM tools to integrate her team knowledge. According to the respondent, the artistic knowledge is the most difficult to integrate within the creative industry as most artists (entrepreneurs) do not want to start their own companies; the artists want to create the best they can out of the company environment. She further explained how the incubator integrates the artistic knowledge with business knowledge. She said that they try not to use business-like approach in the way they deal with the artists. For example, when it comes to writing a business plan, they ask a list of questions to the artists on a white board. The artists then answer the questions, which in turn are reformulated into a business plan. As respondent explained, “we do not do business plans that are 16
pages...we help them make their business plans on white board based on sketches, drawings and general talk. Basically what we do...we try to get them answer questions. After we have gone through all these questions, we can actually take up these documents that are needed to register the company and then we can fill out the answers”.

But overall knowledge integration within the whole organisation is very important as they have several steps of selection of the clients, not only according to their idea, but also according to how they will contribute to the environment, which expertise they will input to gain optimal and effective mixture. The respondent who also works as the head of the incubator as well as the business coach believes that the more diverse the ideas are, the better the integration, that is why the respondent tries to diversify the start-ups according to expertise, age, gender, work experience and other characteristics of the clients.

**Table 11: Main arguments on Challenge 5 and relevance evaluation**

<table>
<thead>
<tr>
<th>Case №</th>
<th>Main arguments</th>
<th>Evaluation (importance, relevance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In order to integrate different expertise involved in the team they use some tools, such as specifically designed checklist to write the business plan, as well as 7-D model, which depicts all the missing knowledge areas for effective knowledge integration.</td>
<td>high medium low</td>
</tr>
<tr>
<td>2</td>
<td>7-Domain Model is used in all projects of the incubator which indicates the importance of knowledge integration, as it helps to map the areas with lack of needed expertise. Despite this tool, inadequate knowledge integration might occur when there is no chemistry, networking, relationships, and other not official techniques, that are very important.</td>
<td>high medium low</td>
</tr>
<tr>
<td>3</td>
<td>The 7-D model explained on the white board from the scratch. Also the basics in marketing, management and other entrepreneurial knowledge that researchers or inventors miss, or detailed description of information about their invention shows high importance of the knowledge integration for the project success.</td>
<td>high medium low</td>
</tr>
<tr>
<td>4</td>
<td>The knowledge integration within the whole organisation is very important, as the entrepreneurs hosted in the incubator are selected taking into account if they can effectively contribute to the knowledge mix established in the organisation. The respondent emphasises the open communication between all the entrepreneurs and the business coaches.</td>
<td>high medium low</td>
</tr>
<tr>
<td>5</td>
<td>The client is asked to construct his/her ‘dream board’, according to which the coach provides guidance to what expertise to incorporate in the project. Mind-mapping, risk management, seminars and other project tools are used to integrate the different expertises. As the entrepreneurs are mostly busy with their day-to-day work, in the end they decide whether to be involved in the knowledge integration built around them.</td>
<td>high medium low</td>
</tr>
<tr>
<td>6</td>
<td>As they deal mostly to artistic people, not using of business-like approaches is essential. For example to write a business plan, they ask them to do it on the white board making sketches, drawings and talking generally. The adaptation of knowledge that is needed for the client is widely used in this incubator, as it promotes the knowledge integration.</td>
<td>high medium low</td>
</tr>
</tbody>
</table>

**Challenge 6: Facing the risk of incomplete knowledge transfer**
1. Adam
The respondent commented to this challenge saying that when they decide to work with the specific idea, they make presentation in a big picture explaining all the work that has to be done. And it’s up to the entrepreneur to do the work or not, because he is the one behind the idea. Afterwards the entrepreneur has to describe his idea. If the ideas are about IT application, and he does not understand, the client should explain to him and also share his intellectual property with him.

2. Aron
The knowledge transfer takes place by talking with each other in non official way or in the meeting rooms. When the client wants to commercialise his idea, he has to go into details and transfer all the knowledge that he has. He must have an open approach and be willing to share his knowledge with them, which means to be ‘coachable’. The respondent gave an example, saying that if a professor in plant physiology from the university comes to the incubator, they wouldn’t find a person with more knowledge in that field, so the researcher would be the main expert in his/her specific field, but in order to strengthen up in other fields, which is their role, the researcher should be as open as possible. When the clients do not wish to transfer the knowledge, it might take some years up to 5 to open up to other people. After several failures they might gain lessons.

3. Axel
For the knowledge transfer the respondent mentioned about official meetings, e-mails and other means. He said that there are clients unwilling to transfer the knowledge they have. Its part of the criteria of being ‘coachable’ or not. In order to get support, the clients should give them all the information. In his opinion, this is crucial for the success of the project. In order to get success in the end, clients have to be open in order to build trust. He pointed out that the business coaches have to work quite close and deep with the clients so that they tell more. Personal relationship is very important in managing this challenge.

4. Becka
The respondent noted that the process of knowledge transfer and learning is very important at the incubator. One of the most important things for the entrepreneurs is commitment to learning, gaining knowledge and sharing knowledge. They conduct regular meetings with all entrepreneurs in order to share experiences, ideas and networks. Basically, the entrepreneurs’ ideas are transferred through interviews, presentations, and formulated questionnaires, while the staffs transfer their knowledge to the entrepreneurs through coaching, published materials and assignments “homeworks” or other tasks. Additional knowledge transfer within the incubator occurs when entrepreneurs make presentations, interact with the advisory board, during meetings and seminars.

5. Britt
The process of knowledge transfer takes place during regular house meetings where staffs give entrepreneurs assignments to share among themselves. They also do things together like team building, having coffees, and talking to each other. The respondent was further asked whether she finds it difficult working with entrepreneurs from diverse areas. The respondent responded by acknowledging that she may not be the right person for every entrepreneur, but she enjoys the challenge of interacting with diverse knowledge fields. Most of the entrepreneurs discuss openly their business ideas and she
tries to support them and in the process, she learns new ideas as entrepreneurs own the processes of doing the business. However they are not forced to transfer all the knowledge, and the respondent even do not pay much attention to it. The decision is made by the client whether to share his knowledge or not.

6. Clara
The knowledge transfer between the artists and the project team is without obstacles. The respondent stated that the entrepreneurs share their knowledge with the team openly unless there are certain things that they do not want to share, of which they are not obliged to. Both the staff team and the entrepreneurs often hold discussions where the entrepreneurs are expected to put down three or four issues that they want to share with their colleagues, both good and bad experiences. Therefore, if an entrepreneur decides to keep some information secret, the respondent thinks that it could be because the information is not useful or it’s personal. But most of the time, the respondent said the entrepreneurs communicate their ideas freely, which is very important for the incubator’s growth.

Table 12: Main arguments on Challenge 6 and relevance evaluation

<table>
<thead>
<tr>
<th>Case №</th>
<th>Main arguments</th>
<th>Evaluation (importance, relevance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The knowledge transfer is important from the client to the team and vice versa. After presenting to the client the work that has to be done, the entrepreneur has to explain more detailed the knowledge domain of his idea; otherwise the support will not be effective.</td>
<td>high</td>
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<td></td>
<td></td>
<td>medium</td>
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<td></td>
<td></td>
<td>low</td>
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<tr>
<td>2</td>
<td>In order to commercialise the idea, client has to go into details and transfer all the knowledge. Most of the cases it’s not possible and is not needed to gain all the knowledge that the client possesses in his/her field, but in order to fill the missing parts of knowledge, the client should not hinder the knowledge transfer.</td>
<td>high</td>
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<td></td>
<td></td>
<td>medium</td>
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<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>3</td>
<td>In case of not ‘coachable’ clients the knowledge is not completely transferred. For getting adequate support and having success in the project the client need to be open and explain his ideas. Otherwise the trust and relationship would not be built.</td>
<td>high</td>
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<td></td>
<td></td>
<td>medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>4</td>
<td>Knowledge sharing and commitment to learning is very important aspect for the entrepreneur. It’s done through interviews, presentations and formulated questionnaires, while the staffs transfer their knowledge to the entrepreneurs through coaching, published materials and assignments “home-works” or other tasks.</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium</td>
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<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>5</td>
<td>The clients decide whether the transfer of all their knowledge will be beneficial or not. After gaining the basic information, the support is given anyway. Not much effort or attention is put on that.</td>
<td>high</td>
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<td></td>
<td></td>
<td>medium</td>
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<td></td>
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<td>low</td>
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<tr>
<td>6</td>
<td>Discussions are organised, where, both the staff team and the entrepreneurs are expected to put down three or four issues that they want to share with their colleagues. Free communication of the ideas is important in the incubator.</td>
<td>high</td>
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<td></td>
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<td>medium</td>
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<td></td>
<td></td>
<td>low</td>
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</tbody>
</table>

Challenge 8: Facing the risk of Lack of Knowledge Map
1. Adam
To the question whether it’s important to be aware of other team members’ expertise and their knowledge network, the respondent replied that it’s especially important for us to know other business coaches knowledge, because if the new business coaches come in, they face problems because they do not know who to refer to, to get the right knowledge. After couple of months of attending the business coach meetings they find out each others’ expertise and networks. The speciality of the business coaches are posted on the webpage of the company, though the expertise within the team is created according to the need of the client.

2. Aron
Concerning to the question whether the knowledge map is important the response was positive, though they do not write down the knowledge map. However when they do the 7-D model, they get a kind of knowledge map including the micro area, macro area, as well as company’s team evaluation. The competences within the business coaches are broad, including IT, life science, medical technology and others, hence they separate certain fields and every second week during the business coach meeting they discuss the incoming ideas and distribute them to the coaches that are interested and available.

3. Axel
The third respondent answered that it was very important for him to know firstly his colleagues’ competences and knowledge level in different areas. If the team consist of 4-5 people it’s very important to know what are they capable to do. It saves time, as you can easily coordinate the resources if you know who to pick for each task. It’s quite time consuming task to find a consultant in a certain area. As they have action plans and follow up meetings to check if the clients have accomplished the tasks until the next meeting, they have to analyse the reasons why it was not done, if it’s not done. Thus if he knows what the team members are good at and not good, he could easily see the knowledge gaps and what homework are doable by the clients and what homework will need hiring external consultancy or consultants directly put in the project.

4. Becka
When the researchers asked the importance of being aware of project team expertise; the respondent stated that due to the small number of staff, they are aware of each other’s expertise and overall knowledge in specific fields. It’s also important to know about the external knowledge sources. They conduct house meetings every third week of the month. Usually all the start-ups are represented in these house meetings. Similarly, staff members also regularly meet amongst themselves. They also encourage team members to socialize by undertaking some activities together like team building or having coffee together. Furthermore, the respondent said that they have documented collective knowledge of the team and stored them in the computer.

5. Britt
The respondent noted that it’s important to be informed about team members’ expertise and knowledge area. At the second incubator, this is not an issue as the team is small and generally work as a family. Concerning the knowledge map, the respondent said collective knowledge is stored and transferred within the company but nothing is written down like a manual. As for the entrepreneurs’ knowledge, she said “…the business owners own their own knowledge…and it’s not upon me to write it down …if I wrote it down it will be old”.

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6. Clara
Concerning the peers’ expertise, the respondent said that since the team is quite small, that is, only three staff members, all team members are aware of each other’s expertise as they work together and consult on most of the issues amongst themselves. Moreover, the respondent stated that the knowledge map is all in the mind and nothing is documented in writing. At the same time, the knowledge and skills involved in the start-up projects are difficult to teach another person, it’s all about tacit knowledge.

Table 13: Main arguments on Challenge 8 and relevance evaluation

<table>
<thead>
<tr>
<th>Case №</th>
<th>Main arguments</th>
<th>Evaluation (importance, relevance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The knowledge map of other business coaches and their contacts is specifically important. The basic information about main specialities of business coaches is placed on the webpage of the company. However, from the perspective of project team, the knowledge map is created according to the need of the client.</td>
<td>high</td>
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<td></td>
<td></td>
<td>medium</td>
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<tr>
<td></td>
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<td>low</td>
</tr>
<tr>
<td>2</td>
<td>Knowledge map is not written down. However the fields are clearly separated within the business coaches. And in the project team the 7-D model is done, which represent the knowledge map including the information on micro, macro area, as well as company’s team evaluation.</td>
<td>high</td>
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<td>medium</td>
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<td></td>
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<td>low</td>
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<tr>
<td>3</td>
<td>Firstly it’s important to know other colleagues competences and knowledge level in different area. The project team members’ knowledge is also important as it helps to set up doable short-term goals, considering the knowledge gaps.</td>
<td>high</td>
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<td></td>
<td></td>
<td>medium</td>
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<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>4</td>
<td>The knowledge possessed by the colleague is well known due to few employees. It’s also important to be aware of external knowledge sources.</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium</td>
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<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>5</td>
<td>Collective knowledge is stored and transferred within the company but nothing is written down.</td>
<td>high</td>
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<td></td>
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<td>medium</td>
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<td></td>
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<td>low</td>
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<tr>
<td>6</td>
<td>The knowledge map of the team members, which mainly overlaps with all employees of incubator, is known. It’s not written down as the most important part of it includes tacit knowledge.</td>
<td>high</td>
</tr>
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<td></td>
<td></td>
<td>medium</td>
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<td></td>
<td></td>
<td>low</td>
</tr>
</tbody>
</table>

Challenge 9: Facing the risk of Knowledge Loss between Phases

The separate stages used in IT projects, where the team changes significantly with each stage, as it performs completely new type of activities for the incremental development of the software, are not applicable and cannot be structured in the same way in the incubators. Even though at the first incubator, they recognise particular stages that the entrepreneur goes through, however, the process of passing the stages does not go in a structured way. Often the development process goes up and down, as well as forward and backward, which assumes starting all over again. As the business coach and the entrepreneur maintain all the knowledge and knowledge network throughout the whole duration of the project, this challenge cannot be addressed in the incubators.

Challenge 10: Facing the risk of failing to Learn
1. Adam
As the incubator field is aimed to promote innovation to adapt more effectively to the fast-paced change of environment, usually the lessons learned from particular project do not represent value for the next ones, even though the establishment of a learning atmosphere through informing other members about the success and failure factors at the end of project could play a significant role. To the question if it’s done at the closure of the projects, the respondent replied that they make an exit plan if there are failures of the not working idea. Nonetheless, many of their best cases have had ideas which have not worked. No official documents are done, but it’s always shared with colleagues. In the incubator, entrepreneurs need to make mistakes, control these mistakes and learn, because some mistakes are not translatable to other businesses. But when there is a disastrous mistake they discuss it.

2. Aron
The second respondent of the first incubator said that spectacular failures of projects are discussed. As failures happen all the time, caused by different reasons, they focus more on the positive side. They often have in their mind particular success factors for vast number of previous projects, which makes easier for them to portion them out through different phases of the new project. Thanks to regular official and non-official meetings they increase their potential for handling new projects.

3. Axel
The third respondent replied that in the end of the incubation projects they consider the success of their ‘graduate’ companies as their personal success, as they build relations and trust with the clients, coach the whole process, inputting other expertises when external help is needed and track the development of the idea. They do communicate to all the business coaches about the problems that arise during the project; ask for advice, and share with new experience and information they gained.

4. Becka
Generally, the second incubator ensures that before the end of the two-year incubation period, the start-up company is strong enough to face the outside world. In this regard, they conduct numerous seminars and trainings to strengthen the weak areas of the projects. As the incubator keep all the contacts of previous companies hosted there, and some of them are also included in the advisory boards of new companies, the incubator manages to maintain the learning environment after finishing the projects.

5. Britt
Concerning this question the respondent reiterated that the start-up companies wind up after the end of two years and basically, before they move out, they have a joint conversation between the team and the entrepreneur to discuss the entrepreneur’s overall experience at the incubator and arrange for contacts in the future. In the end of projects the business coach assists the entrepreneurs with such things like forming company board (for those who do not have the board), finding office spaces and directing them where necessary. The respondent said they do not keep record of failures and successes for each start-up project. Nonetheless the encouragement of open communication depicts the big importance of establishing learning environment.

6. Clara
The respondent stated that when the one-year incubation period comes to an end, they have an exit procedure where they recap what the entrepreneurs have learnt. The
respondent said its important in the last part to know how the entrepreneurs feel and see what they have achieved, what’s good, what could have been done better but also what happens now and how can they continue developing their start-up businesses. The exit form is then documented for reference. In this part, the team try to discuss with the entrepreneurs different ways of what next. The respondent explains that “I really do not want them to move their businesses home or to their flats to sit in their kitchen and do the job because networking is so crucial for getting the jobs and it’s very easy to lose networks when they go home”. Currently, the incubator has 3 or 4 start-up projects that will leave in January 2011. The respondent also stated that they capture lessons learned for each start-up project in the exit form. In this way, the learning environment is created and maintained.

Table 14: Main arguments on Challenge 10 and relevance evaluation

<table>
<thead>
<tr>
<th>Case №</th>
<th>Main arguments</th>
<th>Evaluation (importance, relevance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Exit plan is made if there are failures because of not working idea. The big mistakes that are done within the project are discussed. But in general some mistakes are not translatable to other businesses.</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>2</td>
<td>Keeping in mind particular success factors obtained from vast number of previous projects makes easier to choose and distribute through different phases of the new project. Regular official and non-official meetings increase the potential for handling new projects and learning from them.</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>3</td>
<td>During the project and after the closure, business coaches share out their problems and experiences. The discussion with all the colleagues during the official meeting held every two weeks produce learning environment within organisation.</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>4</td>
<td>Keeping in touch with former incumbents and referring them regularly for supporting the new ones ensures the encouragement and learning environment after finishing the projects.</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>5</td>
<td>At the closure of the project the entrepreneur’s overall experience is discussed and contact information is taken. Individual discussion with every client depicts overall interest of the company to learn.</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
<tr>
<td>6</td>
<td>It’s important for the incubator to learn how the clients felt during being situated in the incubator, what they achieved, what was good, what was wrong captured through an exit interview form.</td>
<td>high</td>
</tr>
<tr>
<td></td>
<td></td>
<td>medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low</td>
</tr>
</tbody>
</table>
To summarise the different opinions on each challenge, the aggregate Table 15 is constructed, which clearly illustrates the level of relevance and importance of all the challenges. The ones that are strongly relevant in the incubators and have high importance for the business coaches concerns to the exit of the business coach, knowledge integration and transfer issues, as well as having an organisational knowledge map and ability to contribute to the learning process after the closure of each project. The knowledge gained from previous projects and team selection mistakes did not have high importance for them, but they were still relevant. The remaining two knowledge based risks did not represent any threat to the organisations.

Table 15: Aggregate table of ten KM challenges derived from IT model

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Case No</th>
<th>1</th>
<th>2</th>
<th>3,7</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Adam</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Aron</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Axel</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>4. Becka</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Britt</td>
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<tr>
<td>6. Clara</td>
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</tr>
</tbody>
</table>

**KM challenges**
1. Lessons not learned from previous projects
2. Team selection flawed
3. Volatility in the Governance Team
4. Lack of Role Knowledge among the Governance Team
5. Inadequate knowledge integration
6. Incomplete knowledge transfer
7. Exit of the Team Member
8. Lack of Knowledge Map
9. Knowledge Loss between Phases
10. Failure to Learn

**Evaluation**
- High importance and relevance
- Medium importance and relevance
- Low importance and relevance
CHAPTER 5: DATA ANALYSIS

5.1 Introduction
This chapter begins with general perceptions of the main concepts and KM practices observed across the three incubators. The first two tables introduce the reader to the analysis of the conceptual model that was derived from the literature review in relation to the empirical findings. The analysis of the model focuses on the three identified domains of organisational knowledge management, project management and project knowledge management. Next, we provide an in-depth analysis of the knowledge management challenges as observed in each of the three domains in the context of incubators. The discussions are based on the empirical findings as well as compared to theoretical perspectives of the study. As a concluding part, a new model is proposed for representation of knowledge management challenges in the management of start-up projects in incubators.

5.2 General perceptions of the main concepts
Empirical data revealed different perception and different interpretation of the knowledge-based risks by the respondents. It was also considered useful for the analysis to gain different perceptions of the main concepts of our research area, as it could provide with introductory information on personal values and values of the incubator concerning our field, as well as it could guide the respondents to the main topic of our research. In the table below, the perceptions of the terms knowledge and project are represented.

Table 16: General perceptions of the main concepts

<table>
<thead>
<tr>
<th>Case №</th>
<th>Perception of main concepts in the context of start-up projects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Knowledge</td>
</tr>
<tr>
<td>1. Adam</td>
<td>Education, which develops the way you think. Knowledge is saved by sharing.</td>
</tr>
<tr>
<td>2. Aron</td>
<td>Ability to take input from the environment and translate it into profitable actions.</td>
</tr>
<tr>
<td>3. Axel</td>
<td>Combination of theory and practical experience. It’s gained mostly by doing.</td>
</tr>
<tr>
<td>4. Becka</td>
<td>Ideas and experience which can be shared through day-to-day formal and informal interaction.</td>
</tr>
<tr>
<td>5. Britt</td>
<td>Knowledge is the outcome of learning by doing.</td>
</tr>
<tr>
<td>6. Clara</td>
<td>Knowledge is something that can be managed through communication</td>
</tr>
</tbody>
</table>
As it can be seen from the responses, half of the respondents emphasized the practical aspect of gaining knowledge. Description of knowledge by Aron, Axel and Britt obviously depicts that knowledge is gained by doing or it’s correlated to the profitable actions. Another half of the respondents pointed out the communicating and sharing aspect of knowledge, its creation and maintenance. This indicates that knowledge which implies experience and practice has more tacit characteristics, while knowledge gained through communication and sharing might involve both types. Becka and Clara, who are in charge of incubators and both have PM education, gave importance to the two types of knowledge, assuming sharing of intuitive and implicit knowledge, as well as formal, published or any other explicit knowledge. From the description of the projects it’s seen that in cases number 1, 2 and 3 the focus of the project is mainly on the development of the idea, whereas in cases number 4 and 6 the projects are aimed to develop the entrepreneurs. In case number 5 the general perception of the project depicts obvious attention on development of incubated companies.

5.3 KM practices observed in the incubators

From the empirical data encompassing the description of the challenges, it was possible to outline the KM practices inherent to each incubator. The following table represents the organisational and project specific KM practices mentioned by the interviewees of each incubator.

Table 17: KM practices in incubators derived from the empirical data

<table>
<thead>
<tr>
<th>KM practices</th>
<th>Incubators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular official meetings within the business coaches to discuss and share the problems and experiences gained in each project</td>
<td>✓</td>
</tr>
<tr>
<td>Regular official meetings within clients to share the lessons learned from new experience and tasks accomplished</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>Follow-up meetings between client and business coach(es) to discuss the difficulties that have aroused while achieving the short-term goals set in the previous meeting</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>Enhancement of organisational knowledge and learning through integration of knowledge of many business coaches</td>
<td>✓</td>
</tr>
<tr>
<td>Establishment of diversified portfolio of clients for optimal mixture of expertise and knowledge in order to create learning environment</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>Distribution of incoming ideas of projects to the business coaches with related expertise and knowledge</td>
<td>✓</td>
</tr>
<tr>
<td>Regular meetings within the staff of incubator and all clients hosted in the incubator to raise questions and share ideas</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>Creation of narrow family environment to support open communication and knowledge transfer</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>Encouragement of non-official meetings by providing appropriate facilities (meeting rooms, coffee drinking spaces and others)</td>
<td>✓ ✓ ✓</td>
</tr>
</tbody>
</table>
Utilisation of large scale databases, such as intranet

- Documentation of the client’s experience, feedback, recommendations and lessons learned at the closure of each project
- Capturing the lessons learned from project by official interviews during the exit of the client from the incubator
- Providing easy access to wide variety of knowledge sources and knowledge networks from established companies within the incubator
- Organisation of common seminars and lectures
- Involvement of second business coach at different stages of incubation according to the knowledge needed

The information provided in the table clearly illustrates the similarities and differences between the incubators. It can be obviously seen that the Incubator 2 and 3 have more common KM practices than Incubator 1. The strong emphasis on optimal and diversified client portfolio, family environment, close communication between all incubated clients, importance of client feedback represent the distinguishing features of the incubators with a smaller number of employees and less turnover of the business ideas (incubator 2 and 3). KM at the organisational level is focused mainly on the clients’ knowledge management, while in relatively bigger incubator, which stands for Incubator 1, KM at the organisational level captures primarily knowledge sharing among the business coaches, through which the organisational learning and knowledge updating is ensured. Distribution of the incoming ideas according to the knowledge domains they derive from, as well as involvement of assisting business coaches differentiates the projects initiated in the first incubator. Due to its larger capacity including Research Park and large office territories, as well as technology intensive characteristics, the first incubator offers wider access to the established companies with similar experience as well as to the larger database. However there were practices shared by all incubators, such as organisation of common seminars and lectures, encouragement of non-official meetings by providing appropriate facilities and discussion of the difficulties that have aroused while achieving the short-term goals set in follow-up meetings between client and business coach.

5.4 Analysis of the conceptual model

The analysis of the conceptual model derived from the literature will help us to gain practical understanding on each domain of the presented model and outline the characteristics of the incubators in the context of the proposed model (Figure 10, p.24). The empirical data gained from the speculation on the knowledge based risks in the incubation projects will be compared to the KM and PM aspects presented in the theory. The analysis will proceed by the theoretical and empirical considerations on each of the three domains.
5.4.1 Organisational Knowledge Management

KM at organisational level represents the initial level of our study. It’s founded on the organisational content of the incubators, which basically include set of start-up projects and funding projects to ensure the financing of the previous ones. One theme that was consistently stressed by the respondents was the significance of organizational knowledge, that is, the knowledge that resides within the organization. The sense of organisational knowledge importance was very high in the incubators. Based on the frequent acknowledgement by the respondents about the regular official and not-official meetings, constant communication and discussions about the experiences and problems aroused during work and continuous knowledge sharing between colleagues and clients situated in the incubator, depicts that organisational knowledge management practices are set as part of the organisational culture.

The Knowledge Creation Model or the SECI Model (Figure 3, p.13) developed by Nonaka and Takeuchi (1995) captures the incubator knowledge management process. Socialization takes place in the incubators, as the staffs cooperates with each other providing opportunity to other colleagues to observe or practice what is done by others. Also easy access of the clients to each other and everyday observation facilitates information gathering and learning process. Externalization of knowledge happens mainly through dialogues. As it was derived from the data, everyday meetings during coffee breaks, corridor talks, and regular official meetings between the business coaches and between the project teams ensure that the knowledge flow process is externalised. Between the project teams the transfers of tacit knowledge is done during trainings and seminars where power point presentations or in-house lectures are made, as well as the use of audio tapes and individual presentations to the entrepreneurs. The combination of knowledge takes place when different experiences and knowledge gained from different projects are combined. Also when fragmented knowledge gained from the stories of colleagues concerning some aspects of projects or lessons taught by the business coach are realised in a linked form. The final process of knowledge creation cycle, internalisation, mostly concerns to the entrepreneurial knowledge base inherent to the incubators. As many of the respondents mentioned about ‘learning by doing’,
internalisation of the knowledge can take place at the same time when you apply the combined knowledge base that you gained in real life.

Most of the respondents acknowledged that it’s not easy to store incubator knowledge because the market development is so rapid that information becomes old very fast. For example, past failures may become present successes. In that sense, information that may have been classified as failure and probably ignored could become useful afterwards. Since the entrepreneur is the source of the project ideas and owns it, storing his idea limit the horizon of the idea expansion if need be. In a similar vein, respondents regarded knowledge in the incubators as tacit knowledge. For example, business coaches tend to keep all the knowledge in “their heads”, which they refer to as the “database”. The argument provided for this, is that business coaching is much more personal than the formal skills learnt in school. It involves creating personal relationships with the entrepreneurs as well as being able to “click” and forge a mutual understanding. This means that an individual personality trait is of paramount in incubators. Knowing how to handle your clients (entrepreneurs) is important. Personality traits like being a good listener and energy giver are difficult neither to teach nor to transfer to another person in the incubators.

**Tacit knowledge transfer**

Another important finding from the empirical data was that the incubator knowledge mainly exists in the form of tacit knowledge. Both old and new knowledge created are rarely stored in the knowledge repositories. As Clara (Incubator 3) and Adam (Incubator 1) said most of the knowledge is in their heads. Nonaka and Takeuchi (1995) defined tacit knowledge as informal skills embedded in individuals which are difficult to articulate nor transfer because they consist of mental models, beliefs and perspectives that are often taken for granted. Knowledge transfer in incubators mainly takes place through social gatherings, house meetings and formal or informal networks. The exchange of information occurs between the project team, entrepreneurs, consultants and partner associates.

For tacit knowledge to be effectively transferred, interpersonal communication appears to be the most important (Fong, 2005). In incubators, interpersonal relationship is very much valued, especially between the project team and the entrepreneurs. Besides, business coaches regularly hold meetings with entrepreneurs to discuss their business development. In these discussions, tacit knowledge is transferred from one party to another and new or emergent knowledge is simultaneously generated. Project managers equally play an important role in the transfer of tacit knowledge. For example, Becka and Clara, who are heads of incubator 2 and 3 respectively, said they mostly use their soft skills and experience to manage the start-up projects.

Tacit knowledge transfer, however, has its limitation since not all of its elements are transferable. According Clara, skills needed to manage the artistic projects are hard to transfer to another person because most of it is learnt by doing. Another way to transfer tacit knowledge in incubators is through social networking. Both entrepreneurs and project staff are encouraged to join different networks as a means to acquire useful business contacts. Usually, it’s from such networks that entrepreneurs find customers for their products.
**Explicit knowledge transfer**

Explicit knowledge consists of formal skills which can easily be communicated or transferred (Nonaka and Takeuchi, 1995). The use of knowledge repositories in incubators is not widespread. Nevertheless, explicit knowledge is still considered as an important means of incubation knowledge transfer. For example, Becka noted that she often compiles reports on each start-up project after every three months in order to capture key lessons learnt and challenges observed. Other respondents as well acknowledged the use of documents and powerpoint presentations as a way to transfer explicit knowledge. For example, Britt from Incubator 2 has been documenting important information for her successor since she is due to leave the company at the end of December 2010. Clara (Incubator 3) also noted the use of exit interview forms at the end of the incubation period to record experiences and lessons learnt by the entrepreneurs. Seminars and workshops are similarly good avenues to transfer explicit knowledge. Some seminars were noted to be industry-specific, that is, they provide the entrepreneurs with materials that are of interest to their particular field.

It’s however, worthwhile to note that both explicit and tacit knowledge get transferred within the incubators. Tacit knowledge is transferred from expert to entrepreneur and vice versa through open communication and dialogue, while explicit knowledge is transferred through books, manuals, and other relevant materials relevant to the entrepreneurs.

### 5.4.2 Project Management in Incubators

According to Schoen et al., (2005), PM models in the incubators act as mechanisms for knowledge transfer as well as facilitators of innovation. Although there are a number of PM models, most of them are not applicable to the incubator industry as incubator projects are not managed in the regular way as other projects in normal companies (ibid). Given the market dynamics of the incubator industry, linear PM models like the water-fall model developed by K. Clark and S. Wheelwright (Figure 6, p.17) becomes inappropriate. However, according to our empirical findings, the basic domains of the water-fall model such as problem evaluation, description of solution, work design, system testing and roll-out are to some extent represented in the incubator projects. For example, at the early stages of the start-up project, entrepreneur’s project ideas are evaluated against market feasibility, potential business risks, strengths, weaknesses, amongst other factors. Thereafter, a project prototype is developed in form of a business plan. Further design work is developed into the project such as reformulating the short term goals and developing the market plan. Depending on the project readiness to market, the roll-out plan may be developed. Afterwards when the business starts to grow, financial benefits are finally accrued with time.

Similarly, the spiral model (Figure 8, p.18) which also uses the principles of the water-fall model to mitigate risks in the projects was partially reflected from our findings. Although none of the respondents said that they use the model in the evaluation process, but from the the researchers point of view and the literature findings, the basic principles of the model is somehow similar to the 7-Domain model used by one of the incubator firms. The 7-D model which is a structured internal tool is used to evaluate the desirability of the start-up project at the early stages. The seven domains include market attractiveness; industry attractiveness; target segment benefits; sustainable advantage; mission; ability to execute critical success factors, and connectednesses across the value chain. The business coaches at the first incubator usually evaluate each
start-up project against the main model domains by examining general factors such as project strengths, weaknesses, market risks, team composition and so on. According to Adam from Incubator 1, the 7-D model offers a better toolkit for exploring and determining market opportunities. The model also provides the basis for scanning the environment to determine the weaknesses and strengths of the project before the entrepreneurs invest their time and effort in writing a business plan. Below is the diagramatic representation of the seven domain model.

**Figure 12: 7-D Model**

*Source: Mullins, 2006*

**Group Knowledge Creation and Learning**

New project ideas that continually stream into the incubators are great learning source for the project team since the ideas are from different fields. In addition, entrepreneurs who join the incubators have different personalities, experiences, backgrounds, skills and knowledge. Moreover, the entrepreneurs are becoming increasingly innovative in generating new ideas, which enables them to emerge competitive in their respective industry. Incubator firms are evenly creating environment for maximizing market opportunities for the entrepreneurs by ensuring that entrepreneurs get all the support needed in terms of physical and human resources. Communication and networking are also at the core of the project team learning process. Through regular meetings and interactions, new knowledge is created and problems resolved. The project team often solve problems through dialogue with their colleagues. Learning also takes place in the incubators through listening and sharing experiences with each other. For example, Britt stated that they regularly invite the incubator’s alumni to share their experiences with the incumbents. The project team also gain knowledge from their peers through staff meetings.

Therefore, collective knowledge creation and learning occurs in the incubators through individual participation and team involvement. As Leuseure and Brookes (2004) observed, the main issue in knowledge management across the projects is construction of collective knowledge, which may lead to low project performance, if not well managed. However, once knowledge and experiences have been gained in the projects,
they become part of project team’s knowledge and thus difficult to identify separately (Fong, 2005).

5.4.3 Project Knowledge Management

Project knowledge management (PKM) is defined as knowledge management in project environments. According to Hanisch, et al., (2009), PKM is the link between the principles of knowledge management and project management. From the incubators, PKM can be viewed from two perspectives. The first perspective is knowledge ‘within’ the incubator projects which is closely linked with the entrepreneurs. The entrepreneurs are the source of the project ideas and therefore own the project knowledge. The second perspective is the knowledge ‘between’ incubator projects which is associated with the project team. This is as a result of the support provided by the business coaches to the entrepreneurs towards the development process of the project, which include management style, business coaching skills, communication style. The knowledge that streams into the projects or emerges from the projects hugely contributes to the overall organizational knowledge.

Usually, different knowledge types are needed at different phases of the start-up project. For example, information about potential customers, market readiness for the product and technological knowledge are important for the early phases of the project, while knowledge about technical solutions, for instance, lawyers’ expertise, and targeted market segment are appropriate for the development phase. Project knowledge accumulated at the end of the incubator period is stored either as explicit knowledge (knowledge repositories) or tacit knowledge (expert knowledge).

5.5 New Proposed Model for KM Challenges in Management of Start-Up Projects

The aggregation of the findings (Table 15, p.53) derived from the empirical data generated a list of knowledge based risks that are relevant for both IT and incubation projects. After getting opinion on each knowledge based risk or challenge faced due the risk occurrence, the researchers came to the conclusion that our methodological framework and the model for validation does not completely fit into the incubator field.

The evaluation of relevance and importance from the perspective of project managers, in this case business coaches, revealed that several challenges do not arise in the incubator field or have low importance. While personal relationships are not critical for the project performance, and social aspects do not determine overall progress of the project in IT sector, incubator projects deal more with soft factors emphasising more on tacit knowledge. Another important factor that hindered the validation of IT sector-based model in incubators is the big difference in organisational structure and constitution of the project teams. As opposed to IT organisations, the incubators have flat hierarchy and the projects are governed and managed by the same person. Also the fact of involvement of the client in the organisation and project team is not consistent with the IT sector. In order to represent the challenges that have been verified to be relevant and important for the incubation projects, as well as to point out incubator specific challenges, a new conceptual model is proposed below depicting the critical areas of our research and main domains of focus based on the empirical findings.
The consideration of the first four challenges identified in the organisational knowledge management domain will ensure the knowledge potential and the strength of the incubator to handle different projects. The way organisations face these challenges, will notify how well the principles of knowledge management are imbedded within the whole organisational system.

The first challenge within this domain is represented by handling the business coach exit from the project. This challenge was originally derived from two knowledge-based risks represented in Reich’s IT model: Volatility in the governance team and the exit of a team member. Even though the project governance consists only of the business coach as the manager of the project, it does not have the same implication as in IT projects. As it was defined before in the literature, and confirmed by the respondents, incubation projects do not involve classic perception of decision making and project handling. The progress of project is strongly dependent on the client. So the project manager or the business coach has both roles: simple member of the project and project governor. The main figures of the project are the business coach and the entrepreneur or the researcher, which means the project might be affected only in case of business coach exit, as exit of the entrepreneur will mean the close-out of the project.

The empirical data proved that the knowledge core of the incubator is formed by the integration of the knowledge of its members. A single change within the business coach team will results into the overall change of the knowledge base of the organisation, as different explicit and implicit knowledge will be shared, different distribution of expertises will be utilised, as well as different relationships and environment will be established. So when there is an exit of the business coach, which was not anticipated by the organisation, the progress of the project will be affected through disruption of overall knowledge flow. Mainly in this case the effect on the organisation is more than on the project as the clients contain the inputted knowledge. Most of the interviewed business coaches did not see that as a big challenge, as the knowledge can be substituted
with the client’s one, who accumulated the knowledge that was passed to him/her by business coach who left. It was revealed from the interviews that this challenge mainly cause loss of time for building relationships and trust within the project members.

The second challenge describing the domain of organisational knowledge management is *communication of the lessons learned*. As it was described in the original Reich’s model, the risk of not learning was basically caused by fragmented and not complete communication of the lessons learned after the closure of the project. Most of the respondents acknowledged that lessons can be learned by doing, especially for the entrepreneurs. Hence failures and steep success periods are perceived normal and are not paid much attention. This challenge is not completely realised by all of the respondents, as lack of time and normal perception of frequent failures do not allow for total concentration on each project results. Although in the third incubator, which is a small incubator, a formal document is completed and general conversation is held with the client to get feedback from the project process and to speculate on alternatives that could have been done during the incubation period. The second incubator, which also represents an incubator with relatively low quantity of business idea inflow, often organised discussions at the closure of the project about the overall experience. The respondents of first incubator developed a shared opinion on how the communication of the lessons learned should be performed. Most of the time it’s done during not official meetings which does not decrease the value of the communication result. On the other hand the challenge is also caused by the reason that almost all of respondents gain tacit and inexpressible knowledge after closing up the project, which is more about establishment of the relationships that will influence the culture of the organisation and creating open communication between the team members and other employees of the incubator.

*Creation of the knowledge map* is highly important challenge faced at the organisational KM level. As opposed to IT sector where the project team involves vast number of people that are entering and exiting the project throughout its duration, venture projects are run within a small group, mainly consisting of the business coach and the client, as well as involvement of other business coaches as team assistants and consultants. In this context the challenge of creation of knowledge map mainly refers to the expertise within the whole organisation as well as the knowledge sources outside the organisation. As the empirical data showed, none of the respondents use physically existent knowledge map, though it’s considered to be relevant and important. In the first incubator overcoming of the challenge allow correct distribution of the project ideas according to the expertise needed for the project realisation. Also they mentioned about the 7-D model, which allows them to find week points for the realisation of the idea and consequently identify the appropriate expertise needed for them. Whereas the first three respondents emphasised creation of the knowledge map of the colleagues, the respondent of the second incubator mentioned about the importance of the knowledge map for the external knowledge sources.

As it was mentioned above external knowledge sources are important units of knowledge management within the incubators. That is why *establishment of knowledge networks* has a great significance in this field. As it was mentioned by Collinson and Gregson (2003), the incubator industry is constrained by knowledge limitations rather than financial ones. So there is high degree of reliance on external expertise. It was evident from the findings that entrepreneurs not only need their own people but also
people from other fields. Start-up projects encompassing vast number of research results from variety of knowledge fields, networking is one of the KM practices that is very significant to them. Through sharing ideas and business contacts, unforeseen market opportunities or jobs may rise to the advantage of the entrepreneurs. Maintaining business or personal contacts with one’s networks is important to the growth of the project.

The next two challenges are presented on the project management domain; they reflect the effectiveness of the project management practices in order to gain group knowledge and learning.

**Appropriate team selection** represents the initial challenge for project managers in all the industries. Relevant competences involved in the project will ensure the quality and other parameters of project success are achieved. However the empirical data showed that in the industry of incubators it does not have high importance, as there are no governance layers, except the business coaches, to decide the team composition of individual start-up projects. In the small incubators the team of the organisations handles all the ideas that enter the incubator. The team might be selected according to the client’s wish or with the advice of the business coach. The members from external knowledge sources are mainly based on the client’s needs. In some cases the business coach refers to the consultant specialised in the research area of the inventor. In the first incubator the business coaches are selected according to the area of the specialisation and also availability. The other team member selection is dependent on the knowledge map that is derived from the 7-D tool mentioned above, which is used for the early stages of incubation. According to Axel, in case of the involvement of new consultants, who had not contracted before, there might arise some problems of team selection. However it may be solved by replacement which will result into loss of time.

The project management will be affected directly if the knowledge from the previous projects is stored. Even though most of the projects respondents in general agreed on low usefulness of the knowledge derived from the previous projects, two of them admitted that in knowledge-intensive projects, the lessons learned from the previous projects are transferable to the next ones. As the official documentation in all of the incubators is taken to minimum, great volume of the information is kept in the memory, which makes the incubator vulnerable to the experts working within the organisation. As it was mentioned by Axel, knowledge awareness of similar projects might lead to an easier way of handling some procedures emerging during the project implementation.

Finally the most specific domain where two challenges might arise is project knowledge management. These are special knowledge management practices designed and utilised especially for the incubator projects in order to generate new knowledge for project goal fulfilment.

The process of **integration of different expertise** captures the main idea of knowledge generation and development. As the clients, who are involved in the team share different experiences, professions and knowledge, the process of knowledge integration often results into creation of new knowledge. Some tools such as checklists, white board and others are used to achieve effective knowledge integration as needed information is sometimes gathered and formulated.
In order to ensure *complete knowledge flow* within the project, there must be some soft factors considered. In cases where open communication is not established, the challenge of transferring incomplete knowledge might result into non-effective support given to the entrepreneur by the business coaches. In other words if the client is unwilling to transfer the knowledge due to the high consideration of intellectual property issues, the support given by the business coaches will not cover all the needs of the client.

In summary, the findings derived from the empirical data obtained from the incubator firms in Sweden, generated eight main knowledge management challenges that are relevant to the incubator industry. They include handling business coach exit, communicating lessons learned, creating knowledge map, establishing knowledge network, selecting appropriate team, storing knowledge from previous projects, integrating different expertise and transferring complete knowledge. Each of these challenges was placed in each of the three domains defined in the conceptual model, in order to highlight the domain it directly impacts.
CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction
This last chapter summarizes the general conclusions and recommendations drawn from the research. Contributions of the study to the theoretical literature and empirical findings are also presented. Further, limitations of the study are pointed out and areas for further research are suggested.

6.2 Conclusion
In the contemporary business environment, organizations are increasingly using projects as means to deliver business objectives. Knowledge management, which is a unique intangible asset, is seen to be crucial to the organization’s success in achieving competitive advantage. It’s argued that managing tacit and explicit knowledge enables the project team to avoid rework and compress time required to plan for a project. The importance of knowledge management and project management to the organizations cannot therefore be understated. It’s from this perspective that the authors decided to conduct a research study on knowledge management challenges in project management. Also, the availability of little research done on knowledge management in project environments was equally a contributing factor.

The rationale of our study was to explore the knowledge management challenges in project management. The main research question was “What are the knowledge management challenges in project management particularly in the case of start-up projects in Swedish incubators?”. This main question was further divided into three sub-questions. The first research question aim was to identify knowledge management challenges in project management, and this was extensively covered in the literature review. The second research question was concerned with the validation of the IT model in the incubator industry. This question was also addressed through the empirical findings which led to the development of a new conceptual model for the management of incubator projects. The last research question was to examine KM challenges in start-up projects in the incubators. This question was also fulfilled through the empirical data obtained from a sample of three incubators in Umeå, Sweden (i.e. Uminova Innovation, BIC Factory and Krenova).

The empirical study was designed following the adoption of Reich’s IT knowledge-based risks model. The ten knowledge-based risks as identified in Reich’s model were reformulated to suit the incubator environment. Thereafter, a multiple case-study design was used to collect data from three incubators. A total of six interviews were conducted from three business coaches and three project managers (three respondents from Uminova Innovation, two respondents from BIC Factory and one respondent from Krenova). After the interviews, a qualitative approach was adopted to present the data and intensively analyse the findings. The results were later aggregated and the level of importance of the KM knowledge-based risks or challenges was noted. The empirical data showed that human capital elements such as education and work experience are important intangible assets to the incubators knowledge pool. It also showed the knowledge management challenges that are strongly relevant to the incubators. They include exit of business coaches, knowledge integration and transfers within and outside the incubators, existence of organizational knowledge map and the ability to create a
continuous learning environment. However, challenges such as knowledge gained from previous projects and team selection flaws had moderate impact on the start-up projects, while lack of role from the governance team and the loss of knowledge between project phases did not represent any threat to the incubator projects.

Subsequently, the empirical findings were analysed using the conceptual model that we had derived from the literature. The conceptual model discussed three main domains of KM and PM, that is, organizational knowledge management, project management and project knowledge management in relation to the findings. The aggregated results of the challenges were then presented on each of the three domains as observed in the management of start-up projects in the incubators. Finally, a new conceptual model was proposed that represents the eight knowledge management challenges that are mostly relevant to the incubators. From the analysis, the new model was found to be more appropriate to the incubator industry compared to the IT knowledge-based model due to several reasons:

First, the incubator project team consist of few (mainly two to three) people. This means that personal relationship between the client and the business coach is critical to the success of the projects. This reason tends to overweigh some of the KM issues that often arise in an IT project team.

Secondly, the hierarchical structures of the incubators were noted to be quite flat. The project managers work concurrently as business coaches (or vice versa) in the projects. This means that project governance is done by one person, and is not distributed between the sponsor, client and project manager as in IT projects.

Thirdly, in IT projects, the product can be delivered to the client then you find out that the client is not really ready to learn from it. In an incubator, this is evident right away since it’s the client who is building the product, and not the team.

Lastly, in incubator projects, the client is involved in the project from the beginning. The client becomes part of the project team and work closely with the business coach to develop the idea to maturity.

Lastly the combination of literature review and empirical analysis made possible to meet all research objectives and answer research questions.

(i) General study of KM challenges in PM, as it was stated in the first research objective, was accomplished after reviewing extensive academic and practitioner literature, mostly on the linkage and the correlation between the both fields. The authors managed to capture all the main findings and illustrate it in the model. The conceptual model depicts all the problematic areas of knowledge in the defined domains of organisational knowledge management, project management and project knowledge management. On the basic and general domain of organisational management, authors observed following challenges that affect overall organisation: explicit and tacit knowledge handling. First one mostly concern to the establishment of knowledge management system, including data repositories, information sharing software and other materials. The second challenge is dependent on the ability and the possibility of human experts to share the tacit knowledge they possess. The third challenge, placed on the domain of project management, refers to the group knowledge creation and learning. On this level knowledge is supposed to be spread across projects, enhancing the learning process of employees involved in project-teams. Finally the last challenge is represented on the domain of project knowledge management, where the importance of various project specific knowledge bases and general project handling knowledge are outlined.
(ii) The collection of empirical data obviously focussed on validating the IT-based model proposed by Reich (2007) represents the second research objective. As it was described in the general findings, not all challenges fit the incubator context. Due to the major differences between the two sectors some of the challenges were not valid and a new challenge was found after data analysis. Hence it can be clearly stated that research strictly followed mentioned objective to validate the IT knowledge risk-based model in the area of start-up projects of incubators.

(iii) The third research objective is strongly linked to the previous one, as it assumes the generation of the challenges that are relevant for incubators. The illustration of the final model depicts all the identified KM challenges that affect PM in incubators. As a result the authors came up with the following challenges: (i) handling business coach exit, (ii) communicating lessons learned, (iii) creating knowledge map, (iv) establishing knowledge network, (v) selecting appropriate team, (vi) storing knowledge from previous projects, (vii) integrating different expertise and (viii) transferring complete knowledge.

6.3 Recommendations

Based on the above empirical findings together with the literature analysis, numerous recommendations are suggested. However, it’s worthwhile to note that incubators have different environmental settings in the management of projects as the success of the project is heavily dependent on the client (entrepreneur). In order to help incubators handle the knowledge management challenges that have been identified and ensure that the start-up projects are rolled-out successfully, the following recommendations are outlined.

To begin with, on the main area of knowledge management challenges, not all of the ten knowledge-based challenges presented were found to be relevant to the incubators. The challenges that were noted to be most relevant include business coach exit, knowledge integration, complete knowledge transfer, knowledge map creation and communication of the lessons learned. Considering these five important challenges, and a new challenge of establishing knowledge network, incubators need to continuously encourage team members’ to manage their knowledge especially explicit knowledge which was found not to be well managed, yet it can have serious ramifications to the organization for example if a team member leaves before storing his/her knowledge. In this case the incubators should consider placing an exit timeline so that the person leaving has sufficient time to transfer his accumulated knowledge to either his colleagues or to the new employee.

Thorough communication of the lessons learned was observed in one of the incubators. As KM best practice found, there was the use of exit interview forms to capture the entrepreneurs’ experiences at the end of the incubation period. We therefore suggest to other incubators to adopt this knowledge tool to capture the successes, failures, lessons learned and other knowledge management challenges faced by the entrepreneurs during their stay in the incubators. In this way, important information which may be useful for future projects are captured and stored. Furthermore, learning from failed projects would represent a new valuable approach to the incubators as they mostly emphasize on the successful projects.

Also, its worth to highlight the importance of open environment for knowledge sharing between team members as well as all people situated in the incubator. As it was
mentioned, formal documentation and databases are not frequently used; hence knowledge in the incubators is widely transferred in the form of tacit knowledge. That is why important organisational and project knowledge cannot be saved if not shared with colleagues in a timely manner.

Similarly, open communication and internal networking were apparently weak in some incubators. We strongly recommend to those incubators to reconsider strengthening their internal knowledge networks and communication. For example, take regular input from potential customers or partners, not stick to the original idea (modify it if needed), encourage informal meetings, share contacts and ideas and be open to other people.

6.4 Contributions of the Study
The researchers ventured into conducting a research study on knowledge management challenges in project management because not much work had been done linking knowledge management and project management. A few past researches that looked into KM and PM did so from the project-based perspectives, in particular, the project teams. Moreover, the researchers empirical design area of start-up projects in incubators was virtually not represented in the literature.

Thus, by conducting this study and analysing its findings, the researchers feel that the knowledge gap that had existed before on knowledge management challenges in incubator projects has partially been filled and new knowledge created. This is also a first step toward building on the pool of available literature and empirical data on the research area.

In addition, the researchers have developed a new conceptual model on knowledge management challenges that is more suited for the incubators as evidenced from the field data. The new proposed model seeks to help incubators to identify the main knowledge management domains and the relevant challenges encompassed in each domain that can affect the start-up projects. Since business incubator firms offer an interesting approach to nurture start-up projects, providing them with a knowledge management model will be of great benefit.

6.5 Limitations of the study
The study experienced a number of drawbacks which are outlined below.

In this study, the researchers used a smaller sample size of six interviews to collect data. The adoption of smaller sample size was as a result of two constraints. First, time constraint could not allow the researchers to go for a larger sample size that would have provided more precision. Second, since the study was descriptive, it restricted the researchers to conduct an extensive study and therefore much attention was paid into detail when gathering data. Thus, the findings of this study cannot be generalized to the population at large.

The study adopted semi-structured interview technique to obtain data from the six respondents from three incubators in Umea. The use of face-to-face interviews as the only data collection method limited the researchers to include other cities in Sweden into the study. Considering other data collection techniques like a combination of interviews and questionnaires would have enabled the researchers to expand the sampling area, hence obtain a more representative data on the Swedish incubators.
6.6 Areas for further research

As mentioned earlier, project management as a knowledge field has not been given much attention in the literature. More so the literature linkage between knowledge management and project management in the incubator projects revealed virtually no research. Only a few papers were found on project management models as innovation facilitators for incubation projects.

We conducted a multiple case-study to explore the knowledge management challenges that are common to the incubator projects. We interviewed business coaches and project managers from three incubator firms, however, our study did not consider the entrepreneurs. Thus, further research is needed to examine how the eight KM challenges identified from this study can be mitigated. The new study should also include the perspectives from the entrepreneurs. The availability of a larger sample size would therefore be needed to enhance the results.

It would also be desirable if more qualitative research on KM challenges is conducted in project-based organizations to compare and contrast our findings. This would have greater implications to the literature and empirical analysis because projects in the incubators are not managed in similar ways as normal company projects. General project management elements such as team selection and governance structure are not explicitly similar across different organizations.
REFERENCES


APPENDICES

Appendix 1: Interview Guide

The Knowledge Management Challenges in Start-up Projects:
Case of Swedish Incubators

Interview Outline

Background Questions

a) Some background information (education, work experience)

b) How many years have you been involved with start-up projects?

c) What is knowledge and learning from your perspective?

d) What do define as a project or project management?

e) How many new start-up projects are you coaching, and what types?

f) Could you describe the standard process of start-up projects?

g) What is a typical “team” in these projects?

- We are applying the model taken from IT sector, so we apologise in advance if some items might be not relevant for the incubators. The model identifies 10 knowledge based risks within IT projects. Our purpose is to validate this model or develop a new model for the incubators.

Main Questions

Q1. Lessons not learned from the previous projects: What do you learn in a project? How do you bring anything to the next projects?

Q2. Team selection flawed: What types of expertise are typically involved in a start-up project? How do you select your team members, if selection process exists?

Q3. Volatility in the Governance Team: Is there a governance structure for each start-up project? How does the change of governance members affect the performance of the projects?

Q4. Lack of Role Knowledge among the Governance Team: Are everyone from the project governance board aware of his/her role and do you think they need some project management (PM) training in order to support the projects more effectively?
Q5. **Inadequate knowledge integration**: Which tools of PM do you use to integrate scientific, technical and business knowledge in a project? Is it an issue?

Q6. **Incomplete knowledge transfer**: What is the process of knowledge transfer from the client to the company and vice versa? Have you experienced difficulties with clients in transferring their knowledge? Does it affect the success of the project?

Q7. **Exit of team members**: How do you handle team member exit from the project? How do you manage the missing knowledge that they contribute?

Q8. **Lack of Knowledge Map**: Is it important for your project team to be aware of peers’ expertise and overall knowledge available in the team? Have you created a knowledge map?

Q9. **Knowledge Loss between Phases**: As your projects consist of four different phases, how do you make certain that knowledge generated from one phase of the project is transmitted to the next phase without any losses?

Q10. **Failure to Learn**: How do you close-up projects? Do you communicate to anyone lessons learned (what went wrong or what was good) at the end of the project? Is it important?

**Concluding Questions**

1. What other types of knowledge-related challenges you experience in start-up projects and how do you mitigate those challenges?

2. From your experience, what are some of the knowledge management practices you think would ensure success for start-up projects?
Appendix 2: Introduction Letter to Respondents

Exploring the Knowledge Management Challenges in Start-Up Projects
(Case of Swedish incubators)

Authors: Ani Karapetyan & Rosemary Otieno
Supervisor: Andreas Nilsson

We are postgraduate students doing Masters in Strategic Project Management at Umea University, Sweden. We are currently doing a thesis on the Knowledge Management Challenges in Project Management: A case of Start-up Projects in Swedish Incubators.

As the contemporary economic and technological environment requires constant and rapid innovations implemented through projects, knowledge management has gained significant attention for successful project management. Moreover the main goal of project management has become to optimally combine the knowledge bases of team members and stakeholders, in order to achieve business success.

This research seeks to identify the knowledge-based problems affecting the success of start-up projects - specifically asking where and how knowledge gaps are formed and identify knowledge management challenges within start-up projects as observed by project managers (business coaches).

We are conducting a multi-company study of incubators, interviewing project managers and business coaches in Umea. With each project manager and business coach, we will conduct a 60-90 minute tape-recorded interview. All data is kept confidential, and no respondent’s names or sensitive company information will be revealed in the publication. No quotes will be attributed to an individual unless previously authorized.

Thank you very much for considering this request for your participation. If you or someone in your organization is willing to provide us with your insight, we will arrange a mutually agreeable time for the interview, preferably in November 2010. In return, you will receive a copy of our thesis with detailed findings and copies of any subsequent publications.

If you have any questions, please contact Andreas Nilsson, School of Business, Umea University. Andreas can be reached at andreas.nilsson@usbe.umu.se or at 090 7867730.