Project Risk Management: A Case Study in Contingencies

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Abstract

The recent increase in international projects has resulted in higher risk along with difficulties in control and coordination. Effective project management can therefore be seen as being essential to the success of projects. The purpose of this paper is to understand how a large multinational company currently handles these issues. This paper conducts a case study that will look at the relationship between contingencies and their effects on project risk management. The findings show that although project risk management handles contingencies in standard projects it still requires improvement within complex projects. Therefore, based on research into agile project management a concept is proposed as an alternative for the case company to select project management method.

Keywords: Contingency, Risk, Project Risk Management, Traditional Project Management, Agile Project Management.
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CROSS CASE ANALYSIS

THE STANDARD PROJECT

Contingencies

Concept Phase and Risk

Planning Phase and Risk

Execution Phase and Risk

Termination Phase and Risk

Communication Risk

THE COMPLEX PROJECT

OUTCOMES

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INTRODUCTION

In this global environment of intense competition, organizations must place increased importance on how they practice project management (Anantatmul & Thomas, 2010). The recent increase in international projects has resulted in higher risk along with difficulties in control and coordination (Lock, 2007). In such challenging environments, identifying efficient approaches is crucial for project success (Chou & Yang, 2012). Effective project management can therefore be seen as being essential to the success of projects (Isik, Arditi, Dikmen, & Birgonul, 2009; Ward & Chapman, 2003).

Within project management, even in the face of these arising complexities, many companies fail to consider the different methods available to them. Rather, companies continue with tried and trusted methods of project management that struggle to rapidly respond to project risk. (Walaski, 2011) This can cause a number of issues as complex projects often do not behave the way they are expected and the effects often take time to emerge. According to Thamhain (2013), because of the time and budget pressures of today's business environment, it is therefore not surprising to find project managers focusing most of their efforts on fixing problems after they have impacted performance.

In previous research, Thompson (1967) suggested that managing uncertainties is the central problem for complex organizations and that technology and environments are major sources of uncertainty. To deal with these contingencies, he explained that rational organizations would use different strategies for interaction and organizational design. In more recent research Thamhain (2013) describes how it is common for managers to only deal with contingencies after they have impacted project performance or have been noticed in schedules, budgets or deliverables. Although the understanding of the difficulties associated with contingencies have a well-grounded foundation it is obvious that organizations are still affected by them.

It was found by Thamhain (2013) that contingencies in the project environment do not impact the performance of all projects equally and that early identification of contingencies is vital for managing and minimizing any negative impact on the project’s performance. The basic foundation underlying research into Project Management is the adoption of project management, by many organizations, as a method for resolving complex problems...
(Söderlund, 2004). This, in conjunction with the effect contingencies can have on a project, has led to the development of risk management into a core project management discipline. Increasingly, organizations today understand how weak risk management can be a major contributor to project delays, cost overruns or outright failure. Despite this many organizations lack experience when it comes to risk management and are unable to properly evaluate the effectiveness of their risk management processes. This inevitably leaves them unprepared to deal with project risks. (Hopkinson, 2011)

This paper intends to explore the relationship between contingencies and their effects on project risk management. Therefore, we focus on whether a company’s current project risk management is able to deal with contingencies and what the literature offers for alternatives. Previous research will provide us with a deeper understanding of contingencies, project management methods and project risk management aspects. The empirical material will help to understand how a large multinational company currently handles these issues. Through the findings, the researchers aspire to further understand the relationship between these research areas and consequently, propose a concept for a company to use when contingencies occur.

**Research Question**

Is project risk management suited to the contingencies faced by project managers?

What does the literature offer for a company’s project risk management to be enhanced towards the contingencies faced by project managers?

The disposition of the paper therefore starts with a literature review of the research area. This is followed by a method section which describes the research method employed and the way in which data was collected and analyzed. A company background along with a detailed description of four cases then provides an empirical storyline. This will lead to a cross case analysis where the literature review is used to analyze the empirical information. Finally conclusions are drawn and suggestions are made.
LITERATURE REVIEW

CONTINGENCY THEORY

Project management literature generally does not address the importance of project contingencies though rather assumes that all projects share the same set of characteristics (Shenhar & Dvir, 2007). Organizational contingency theory presumes that every situation is different and that approaches to organizational problems cannot be universally applicable (Redding, 1976).

Classical contingency theory asserts that different external conditions might require different organizational characteristics. Burns and Stalker (1961) introduced the concept of organizational contingency theory and suggested that organizations establish a fit between the degree of risk within their environment and their process characteristics and structure. As a result of environmental risks (such as environmental complexity, rate of change, and the availability and clarity of information) the organization is said to require an organic structure with more expert based power and less centralization of authority (Melan, 1998). While the organizational contingency theory was initially used to describe organizations, it has been shown to be relevant in understanding and managing smaller groups, such as teams. (Barki, Rivard, & Talbot, 2001)

The research that has been conducted on organizational contingency has strongly influenced a contingency approach to project management. Most studies have focused on the impact of uncertainty and change on the way organizations are conducting their project operations. (Shenhar & Davir, 2007) Within contingency theory, the contingencies that a project faces dictate the extent of information exchange and decisional autonomy needed to effectively complete project tasks (Hayward & Zmud, 2002). Barki et al (2001) explain that if a project is managed based on the degree of risk in the project's environment it will be more successful than projects that are not.

Given the high velocity with which decisions are made and the shortened life cycles of projects, time and urgency become central factors in any project (Shenhar & Dvir, 2007). However, at the beginning of a project the likelihood of occurrence and degree of impact are unknown. Examples of these are customer changes, design failures, and contractor issues that
could have been expected though catch project managers by surprise. This is an area where improved management discipline, policies, and procedures can be effective in dealing with the risk factors. (Thamhain, 2013)

The basic proposition of contingencies within project management is that if the task is well understood prior to its commencement much of the activity can be preplanned. However, as the task uncertainty increases a greater amount of information must be overseen among decision makers in order to achieve a desired level of execution. (Barki, Rivard, & Talbot, 2001) In practice, this would result in having high levels of integration in high-risk projects and lower levels in low-risk projects (Barki, Rivard, & Talbot, 2001). The results of a study, conducted by Shenhar (2001), into contingencies within projects demonstrated that management and organizations in general should adopt a more project-specific approach to project management. This use of contingency planning is an ideal means not only for assuring that the outcomes achieved match those that are planned though, also in preventing undesirable occurrences (Saad & Siha, 2000). Jones and Ryan (2002) build on this and argue that a poor fit between a firm’s internal structure and external environment will inevitably lead to failure.

**The Uncertainty Pace Complexity Model (UPC Model)**

Through their research on contingency management Shenhar and Dvir (2007) identified three factors to identify within projects: uncertainty, complexity, and pace. This framework, illustrated below, is designed to allow project managers to select the appropriate management method depending on the contingencies they face.

*Source: Shenhar & Dvir (2007) – UPC Model*
Uncertainty refers to the fact that all projects have different levels of uncertainty and project execution can be seen as a process that is aimed at uncertainty reduction. These uncertainties can be either internal or external, depending on the environment and on the project in question. As the amount of uncertainty surrounding a project increases so too does the risk. (Shenhar & Dvir, 2007)

Project complexity is a result of the project scope, number and assortment of elements and the connection amongst these. Complexity within a project can also be affected by the complexity of the organization. As the level of risk in a project increases along with complexity the makeup of the project as well as the way in which the project will be managed should be determined accordingly. (Shenhar & Dvir, 2007)

The third factor, pace, encompasses the urgency of time goals. Two projects with the same goal though different time constraints may require different project methods. (Shenhar & Dvir, 2007)

In order to select the appropriate project management method Shenhar and Dvir (2007) suggest that project managers first classify a project according to its levels of uncertainty, complexity, and pace. They should then select the right project management style to fit the specific project type and its requirements.

**TRADITIONAL PROJECT MANAGEMENT**

According to Ward & Chapman (1995) traditional project management is broken down into 4 phases. These phases are concept, planning, execution and termination. Each of these phases carries their own length of time and incurs costs during the project process.

The concept phase is the first part of the project that requires the specifications to be drawn up so that the project is deliverable and beneficial to the user (Ward & Chapman, 1995). It is also important that the drawing up of the concept fits in the company’s scope for taking on the task (Lemaitre and Stenier, 1988). Once the concept is clarified then it moves on to the planning phase of the project.

The planning phase of the project is when basic planning of the project has begun. This basic design is needed so that a time schedule for the project can be made (Ward and Chapman, 1995). A good time schedule is important so that the resources can be allocated effectively. A
proper team is important so that the right knowledge is best fit to the task (Turner, 1992). Once the planning phase has been approved then it is time to execute the project.

In the execution phase the project manager takes responsibility for the whole project. The project manager must constantly control and modify the project so that the deliverable deadline is met. This means times can be rescheduled, resources reallocated and control of the project constantly evaluated. In this stage, it is common that the greatest costs occur due to rising risks and uncertainties. (Ward and Chapman, 1995)

The final concept in the project process is the termination phase. In this phase the completed project is delivered to the user. This stage also provides the user with the business support to maintain customer relationship in order to gain newer projects in the future. This final phase also allows for review and further knowledge to be used on other projects (Ward and Chapman, 1995)

**Project Management Team Structure**

Due to the wide range of situations companies find themselves in it is not strange that there are many different ways for organizations to structure projects. Within each organization a prevailing mode may exist with procedures and systems in the organization requiring that all projects adhere to the chosen mode with minor adaptations. Occasionally exceptions to the selected mode are allowed when the project clearly demands something different. (Clark & Wheelwright, 1992)

In their research into how project activities can be organized Clark and Wheelwright (1992) identified four dominant structures. Each structure has a related project management role, which results in a range of alternatives for managing development projects. The four-team structures identified by Clark and Wheelwright (1992) are functional, autonomous, lightweight and heavyweight.

As functional team structure represents the grouping of people by function with work flowing sequentially from one function to the next and no oversight from a project manager. In the autonomous team structure, individuals from the various functions are formally assigned, dedicated and co-located to the project team. The project manager is given full control over the resources contributed by each functional group and is not required to follow existing organizational practices and procedures. (Clark and Wheelwright, 1992) The exploratory
nature of the research validated that functional and autonomous structures were not applicable and therefore the focus is on lightweight and heavyweight structures.

The diagrams below, developed by Clark and Wheelwright (1992), illustrate lightweight and heavyweight team structures.

*Source: Clark & Wheelwright (1992) – Team Structure Models

Within the lightweight team structure members are assigned to the project though remain within their function; each function then designates a liaison to represent it in the project. These functional managers work with a ‘lightweight’ project manager who has responsibility for coordinating the activities of each function. The project manager is seen as ‘lightweight’ as even though they are responsible for updating and coordinating the various functions the key resources remain under the control of their functional managers. Lightweight managers do not have the authority to reassign members of the project team or modify resources. The strengths of a lightweight team structure include the fact that the managers that control resources also control the performance of the projects tasks within their function. Another major benefit is that specialized expertise is brought to the forefront on key technical issues. This results in functional managers benefitting from prior experience and acting as a source of
knowledge that can be used over time and across projects. However, lightweight team structures are also seen to have a number of weaknesses, as each project differs in its objectives and performance requirements it is stated as being unlikely that functional specialists will have the same requirements in various projects. In addition to this, in many projects not all activities are known in the concept or planning phase which results in limited coordination and integration. (Clark & Wheelwright, 1992)

In contrast to the lightweight structure within heavyweight team structure there is a ‘strong’ project manager that exercises a direct and integrating influence across all functions. The heavyweight structure gives the project manager direct access to and responsibility for the work of each function in the project setup. Also, project managers within the heavyweight structure have increased influence over the other members in the project group through increased contact, communication and the ability for resource allocation. The main benefits of a heavyweight structure are that it brings integration and a higher level of communication to the project. The heavyweight structure is also seen to create a sense of ownership and commitment within the project. It is also stated that the improved communication and coordination results in a project that better meets customer requirements. Weaknesses that are mentioned of the heavyweight structure are that as the project team is given a larger scope to operate within they may overstep their limits within the project and the organizations chosen framework. Another weakness that has been raised is that because members may have reduced contact with their function this may cause conflicts of interest. (Clark & Wheelwright, 1992)

Clark and Wheelwright (1992) argue that there is a great need for firms to match their team structure to what is required by the type of project. Especially if projects that do not fit into the type that the organization usually carries out. What is important to ensure is that multiple structures can coexist and work to strengthen the organization in the long term. (Clark & Wheelwright, 1992)

**PROJECT RISK MANAGEMENT**

Risk management is heavily integrated in the field of project management. Risks within a project can be seen to be potential threats leading to a variation from predefined objectives and therefore could impact project success (Holt, 2004). Practicing project managers have been aware that limiting the impact of uncertainty is important, but formal recognition as a
project management function has been relatively recent. For example, risk management was only separated into its own knowledge area in the 1986/87 update of the Guide to the Project Management Body of Knowledge (PMBOK) (Pender, 2001).

Olsson (2007) also believes that risks within a project have gained greater attention within organizations. He goes further in claiming that risk can sometimes fall outside of the scope of the project (for example communication risk). Depending on the severity of these potential events, specific measures are taken, such as the use of a contingency fund to mitigate these risks. This risk management process assumes that events are known and can be quantified with some probability before the implementation of a project. (Holt, 2004; Lechler, Edington, & Gao, 2012; Godfrey, 1996) The fact that the required level of risk management in poorly defined projects increases suggests that in highly complex projects something must be done (Besner & Hobbs, 2012). The traditional view of project risk management emphasizes the importance of planning as one of the major practices. (Alderman et al., 2005; Wikström, 2005)

These risk management activities are generally correlated to the respective function, for example the sales department and the contract they create, business process and technical process. The function should then be integrated in the project risk management process in a way that results in communication being interlinked, transparent and useful for everyone involved in the project life cycle. (Olsson, 2007; Ward & Chapman, 1995)

**Communication Risk**

*This section is placed before the project risk phases because it is been proposed that communication risk encompasses the whole project management process.*

In a traditional economic sense communication theory is an exchange of messages between parties. Thus, every message is also transferable and carries a different level of value (Craig, 1999). These messages however, do not always carry a positive value and can face a communication breakdown between two parties or become misaligned. To look at communication in terms of risk, theory and practice would cover a broad spectrum (Ferrante, 2010). Therefore, it is proposed to look at communication theory and its effects on project risk management theory. Communication risk is considered to be a large aspect of project risk management because of the choice made in sharing information both internally and externally (Koskosas, 2008). Dimitroff et al. (2005) suggest that risk management should promote multiple channels of communication and establish groups to work on project risks. Project
failure as a result of these risks can stem from unreliable or irresponsible use of transferring knowledge between the sender and the receiver, which in turn can affect a project. (Koskosas, 2008) According to Thamhain (2013), within project risk management one of the major hurdles to overcome is the ability to promote desired behavior. This includes effective communication among team members and amongst support units across organizational functions.

The quality of communication used within a project affects the level of cooperation and the capability to identify, process, and deal with risk factors. Communication helps to build a united project team that focuses on cross-functional cooperation and desired results. Plough and Krimskey (1987) state that risk communication should be a two-way activity. Risk communication in a two-way mode includes understanding and integrating the viewpoints and perspectives of other people (Plough & Krimskey, 1987). Communication channels within this mode are related to interactions within the organization that are critical to its task and can compromise both formal (email and documentation) and informal (unplanned face to face meetings) (Shenhar, 2001). Häggren and Maaninen-Olsson (2005) argue that interactions and communication amongst the project team contributes to shared knowledge and helps in distributing acquired knowledge both internally and externally to the project. Such a project-oriented environment results in increased transparency to emerging risk factors and will result in an action-oriented, cooperative environment that can identify and deal with contingencies early in their development (Thamhain, 2013).

Henderson and Clark (1990) support this by explaining that the strategies project managers use for communication emerge in an organization to help it cope with complexity. In complex projects this is vital as the increased level of uncertainty and potential changes require large amounts of information exchange and extensive communication. (Shenhar, 2001) According to Shenhar (2001), the level of project communication should be decided by the level of uncertainty. For projects at low and medium levels, communication will be less intense and frequent than for projects at high levels. At the high levels managers of projects will benefit from numerous formal and informal communication channels for interaction among project team members. (Shenhar, 2001)

When looking into research regarding communication within project management many studies place communication near the top of the skills required by successful project managers. (Pender, 2001) Research carried out by Park (2010) took shows that the reason
why most of the projects studied failed because of breakdown in communication. As the situation within a project can change so fast, extensive communication is essential among project teams and team members. (Park, 2010) Within Sandhu and Gunasekaran’s (2004) study the participants indicated that open communication was an important aspect in process development, regardless of the specific project role. As a result of this, understanding objectives as well as developing communication and coordination between the parties involved is of crucial importance to project success. (Perminova et al., 2006)

Concept Risk

Knowing and quantifying these risks can be achieved by investigating and analyzing sources of risk (Lechler, Edington, & Gao, 2012) during the projects concept phase (Ward & Chapman, 1995). Having project standards in place during this phase is seen to potentially offer a plethora of tools that can support the project's level of analyzed risk (Lechler, Edington, & Gao, 2012). Ultimately, since the accountability to achieve project goals lays with the project manager the responsibility of the effectiveness of project risk management lies with the project manager’s scope. Within the project, various levels of application of risk management exist as a result of the risk management method in use (Olsson, 2007).

Planning Risk

In the planning phase the project manager’s success is based on the outcome of how well one can plan, execute and control the project activities (Ward & Chapman, 1995). From here on in the product life cycle relationships with stakeholders also become an important factor for the project manager (Olsson, 2007). The relatively unknown risk that occurs in the planning and execution phase usually stem from communication and poor planning of the product design and allocation of resources (Thamhain, 2013).

Poor planning can be factor because of the unknown nature of the project at hand. Project managers face unknowns due to the different capacities and requirements each project can bring. While a project manager can have their own set of standards, this does not necessarily mean that it will fit into each project and mitigate potential risks. (Adams and Barndt, 1988). Therefore, project managers carry their own standards and scenarios that could slightly deviate from company standards when planning the project for execution. According to the
conventional project management conceptual framework, more uncertainty is generally found during the early phases of the project (Winch, 2001).

**Execution Risk**

The execution phase in the project life cycle is usually where most risk and uncertainties come to the surface. Consequently the greatest cost from risks occurs in this stage of the project life cycle. One major risk is with controlling the project based on the initial plan. In many cases, the design of the project can experience changes and the project manager therefore has to adapt to these changes. A project manager needs to effectively communicate with internal and external stakeholders in order to maintain control (Ward & Chapman, 1995). Based on communication, risk can also occur in the execution phase if the concept phase lacks a clear definition for the project life cycle. This lack of clarity can leave out crucial planning in the planning phase that in turn will show up in the execution phase. This brings a lack of control to the project that will require the project manager to bring immediate attention to creating a solution to the problem (Ward and Chapman, 1995; Thamhain, 2013)

**Termination Risk**

In the termination phase, Ward & Chapman (1995) make the claim that deliverables that have not been approved by the end user is not a risk. It is rather considered ‘unmanaged risk’ from the previous phases due to a lack of clarity. Consequently the researchers go on to say that payments could not be received and proper action will need to be taken to modify the projects product to proper specification. They, also go further on to say that any surprises in this stage with regard to support and review are also under the same category of previous ‘unmanaged risk.’ Once again, Olsson (2007) also backs this claim by emphasizing the importance of proper risk investigation in the beginning phases in order to avoid later surprise.

**AGILE PROJECT MANAGEMENT**

Agile project management represents an emerging view that is more sympathetic of the need to resolve uncertainty caused by environmental turbulence and changing requirements. This style of project management dictates the utilization of creativity, intuition and the building of tacit knowledge over time and through experience. (Leybourne, 2009)
It is generally accepted that the concept of agile project management emerged from principles adopted by software developers, namely agile software development (Cockburn, 2001). The main principle of agile project management, which has been generated from the software mindset, is described by Leybourne (2009) as creating adaptive project teams that can respond rapidly to changes in their project’s ecosystem. Cervone (2011) argues that the main principles of agile project management are that risk is minimized by focusing on short iterations of clearly outlined deliverables and that direct communication with stakeholders in the development process takes the place of creating large amounts of project documentation.

As a result of this agile project management centers on defined deliverables and will therefore result in an output that is closer to the requirements than the output of traditional project management. Agile project management is seen as a means of dealing with internal and external risk, which is not reduced through experience. Internal risks can be described as areas that can be controlled by the project manager, such as scheduling (including the “iron triangle” of cost, scope and time). External risks are other factors that are not directly controllable by the project manager, such as environment and high-level strategy. (Leybourne, 2009)

A defining aspect of agile project management is that project teams adapt quickly to the unpredictable and rapidly changing environments that most projects are carried out in (Leybourne, 2009). Agile project management encourages stripping away as much of the bulk, commonly associated with traditional methods, as possible. This encourages quick responses to changing environments, changes in user requirements and accelerated project deadlines. (Erikson et al., 2005) According to Hansson et al. (2006) collaboration, cooperation and communication within the project team is crucial to project success.

Due to the infancy of the agile philosophy, concrete evidences in favor of agile are relatively few. Many projects are gradually trying to use the agile methods in their development project and are reporting success stories using them. (Misra et al., 2012)

A study into agile project management methods by Ribeiro and Fernandes (2010) found all informants agreed that the external environment plays a critical role on the way businesses are managed. Most of the project managers surveyed agreed that agile methodologies are necessary and expect that they have advantages in enterprise business management. However, it is recognized that problems in adopting agile principles and values still exist, although the managers surveyed in this study are aware of the business value of implementing them. In
their findings Ribeiro and Fernandes (2010) described agile organizations as having flexibility, speed, leanness, responsiveness and increased opportunities for learning.

During a large study Thamlain (2013) found that contemporary project management platforms such as agile project management can simplify the work process, reduce development time, and enhance organizational transparency. In an earlier study of a development organization Paasivaara et al. (2008) found that the overall experiences in using agile project management were very positive. Their findings indicated the use of agile project management effectively improved communication and motivation, as well as giving a perception of better quality control.

Due to the requirements of high agility proposed by agile practitioners, the nature and level of communication within a project plays an important role in the success of agile methods being employed. (Misra et al., 2012) In their study Ramesh et al. (2010) found that frequent, short meetings were organized between the project team and were used to enhance communication. In a number of the firms studied, all project members attend the meeting, whereas in others only the project manager, technical lead or developers meet. These meetings were considered very valuable by the participants. (Ramesh et al., 2010) During their study Paasivaara et al. (2008) found that agile methods encouraged frequent communication within the project team, both during meetings and informally. The biggest benefit seemed to be the systems that require frequent communication. The study also found that it is just as important to communicate informally outside the meetings. It was also observed that the frequency of formal communication was witnessed to assist in the occurrence of frequent informal communication.

Ramesh et al., (2010) found that when agile methods were used changes become easier to implement and cost less. Wells (2012) conducted a large-scale case study in which a number of project management methods were compared. The results of this study found that for the case, the company’s agile approaches have helped overcome a number of limitations, including communication and delivery time. A core principle in agile methods is to adapt and react quickly to changes (Misra et al., 2012).

As previous research has shown agile methods offer considerable potential for application though there are significant hurdles to its adoption in the actual phase (Ribeiro & Fernandes, 2010). Nerur et al. (2005) states that organizations should be cautious when considering implementing agile methods or integrating them with existing management practices.
Within agile literature there has yet to be any documented cases of failure regarding agile methods (Misra et al., 2012). However, a number of researchers have been critical about the usefulness of agile and its apparent ability to fix project management issues (Misra et al., 2012). Irons (2006) has discussed agile as being over-hyped and misunderstood. He elaborates on this by outlining the difficulty in getting the right people involved and the danger of inappropriate application. Lindvall et al., (2002) state that agile methods will work only when the performance requirements are explicitly stated at the outset of the project. Keil and Carmel (1995) maintain that the effectiveness of communication between the customer and team depends on several factors. These include the customer’s availability, customer consensus and customer communication, especially at the beginning of the project. Indirect links between the customers and developers through intermediaries are less effective than direct links. (Keil & Carmel, 1995) This is built upon by Paasivaara et al. (2008) who state that agile practices do not work if all parties involved in the project do not learn to communicate.

The general consensus amongst the literature (Leybourne, 2009; Cervone, 2011; Misra et al., 2012, Thamlain, 2013) is that agile methods are not a ‘universal best practice’ though rather can be a useful practice in the right circumstance.
METHOD

The research paper is based on what Saunders et al. (2009) describes as a multiple case study, that is, more than one case is being used though from the same organization. The reason for using this type of case study is that it is easier to generalize and provides a better foundation than a single-case study (Yin, 2003). An issue with a case study approach is that they can blur the boundaries between the phenomenon being studied and its context, however case studies also act to provide the research with multiple sources of data. (Yin, 2003) The direction of the research paper is that of a qualitative embedded case study. An embedded case study is one that will look at a single company’s project management unit that touches upon other subunits that interact with the project management team (Saunders, Lewis, & Thornhill, 2009). This approach was taken

QUALITATIVE RESEARCH

In order to collect sufficient data multiple qualitative data sources were used. This allowed the exploration of possible phenomena (Saunders, Lewis, & Thornhill, 2009) within a large multinational firm where project risk management and its contingencies prevent a universal application and tend to be rather customized to the company (Redding, 1976). Four project managers were interviewed, each describing a project that they have experienced that has brought high risk and/or uncertainties during the project process.

This approach is considered to be abductive and was chosen to gain a better understanding in the field of study from expert knowledge (Chamberlain, 2006; Saunders, Lewis, & Thornhill, 2009). An abductive approach was selected because project management in large companies contains their own set of rules and policies that cannot always be carried over to another company. Therefore, by looking at the empirical findings as exploratory measures first the papers research question and literature review can take shape and focus (Chamberlain, 2006) This paper is not designed to provide a generalized solution for every company though rather provide an insight into contingencies and risk management and investigate what the literature suggests for enhancements.
DATA COLLECTION

Before the search for respondents began, it was determined that all information that could identify the company would be withheld from print and that all respondents would remain anonymous. This was required in order to increase the chance of finding project managers that could provide more honest and sensitive information without putting their company at risk. Of the six project managers in the department four were interviewed. The other two remaining project managers were posted overseas during the duration of the research and therefore could not be contacted. Although the researchers attempted to contact other actors involved in the projects, such as engineers and customers, this was not allowed. The engineers involved had multiple projects ongoing which caused time constraints and the company was concerned at the possibility of overly sensitive information being revealed. The company was not willing for customers to know that they were being researched as this may damage ongoing relationships.

Data collection included interviews with each project manager, internal company documents, field notes from visits to the company and informal conversations on various topics. Thus, the study consisted of six face-to-face semi-structured interviews, sitting in on two customer meetings, supplemented by group meetings, various internal documentation and observational data. As explained by Saunders (2009) the researchers shadowed employees who were likely to be important in the research. The researchers followed project managers during a typical workday which helped develop insights and gain a good understanding of the company. The researchers were also taken on a guided tour of the company’s offices in order to gain an understanding of the department’s layout. In order to first identify the various areas of risk that managers within the company encounter, the authors spoke with the project managers, both individually (through relaxed conversations), and also in a group setting by hosting a meeting of all project managers. The interviews with each project manager were preceded by the above mentioned visits to the company and a number of informal conversations took place with potential respondents. This also allowed the researchers access to review a number of the company's internal documents, data and archive. Amongst these documents were the company’s project management handbook (framework), a number of project specific time plans and project risk assessment analysis that had been conducted.
UNSTRUCTURED INTERVIEW

When the company was selected for the qualitative analysis Saunders, Lewis, and Thornhill (2009) believe that lack of knowledge could be an issue when asking questions. Therefore an unstructured and open interview was conducted in a group setting to get an overall picture of the project management department. The idea of this interview is to give the interviewee a chance to provide basic information on a certain aspect or topic that they see as having key issues. Therefore, this allows for the narrowing down of the research area from experts perceptions, which in turns provides a more focused direction (Easterby-Smith et al. 2008; Ghauri and Grønhaug 2005; Robson 2002).

SEMI-STRUCTURED INTERVIEWS

Semi-structured interviews were conducted when the researchers had explored the topics present in the unstructured interview. Project managers were requested to provide information on their single case based around the researcher’s desired area of exploration. Having a semi-structured approach to the interviews allowed for the research to maintain focus but also allow for further unforeseen aspects of interest to be questioned to be investigated. (Saunders, Lewis, and Thornhill, 2009).

Yin (2003) also claims that a semi-structured approach allows probing questions in which the researchers have outlined the aim to the participants so a thorough picture is provided. A thorough picture is what a participant gives in order to provide a view that is in favor to them and/or their company. The added benefit of semi-structured interviews means that if a probing question lacks a clear responsible then further clarification can be requested (Saunders, Lewis, and Thornhill, 2009).

Within the semi-structured interviews the researches brought up the main principles of agile project management, without describing the method. This was done in order to determine whether agile methods could be used in the cases and the company. Further details of the interview framework can be found in appendix B.

TYPES OF INTERVIEWS

The unstructured and semi-structure interviews were carried out initially in face-to-face interviews that provided the cases. Face-to-face interviews are a good way to get information
by reading body language that can allow the interviewer to probe further (Saunders, Lewis, and Thornhill, 2009).

Follow up interviews however were conducted primarily via email and telephone in order to gain further clarification from the initial face-to-face interview compared with further explored literature and documentation provided by the company. All telephone and email interviews have been conducted after the fact because all the project managers are required to travel to different countries. This was a benefit however as the response had the convenience of more focused answers together at the speed at which they were answered (Saunders, Lewis, and Thornhill, 2009).

Telephone interviews were carried out with the participants that have not had the time or have been on assignment in other geographic locations around the world. As a project manager within this particular global company, travel is quite a frequent occurrence. The negative aspect of carrying out telephone interviews is the possibility of losing control. The interview may also lose the ability to dig out answers because of lack of presence that could guide the interview direction (Saunders, Lewis, and Thornhill, 2009).

DATA ANALYSIS

Following the interviews the authors transcribed the audio recordings and interpreted the data. The researchers first read through the transcribed interviews separately and the relevant sections were selected. The interpretations of the sections used were then sent back to the specific project manager that was interviewed so that they may approve our interpretations as correct. The interview in Case Three did experience misinterpretation in one area. Respondent C sent an email back clarifying what was misinterpreted and gave his actual meaning in further words. Once the case descriptions empirics were finalized these were then sent to each project manager a following time. All project managers interview approved of the final empirics with no further suggestions. It is also worth noting that the added intention was so that the project managers made sure any sensitive information given was conveyed in a way that held anonymity so that the company remained protected.

The data analysis that the paper employs is multiple levels of analysis within a single study (Yin, 1984). The data was first analyzed in what is described by Yin (1984) as a within case analysis in order to gain familiarity with the data and create preliminary theory generation. A within case analysis is seen as helping investigators cope with one of the realities of case
studies, a deluge of data (Yin, 1984). The layout of the within case analysis follows a structure similar to a description and is central to the generation of insight (Gersick, 1988; Pettigrew, 1988). This has been described by Yin, 1984 to develop an understanding of each case and therefore accelerates cross-case comparison. The next phase involved a cross case pattern search, which has been described to force a deeper understanding of the material in order to investigate beyond initial impressions (Yin, 1984).

**CASE DESCRIPTION**

<table>
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<tr>
<th>Interviews</th>
<th>Role of Informant</th>
<th>Interview Type</th>
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<td>Case 1</td>
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<td>Case 2</td>
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<td>Case 3</td>
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EMPIRICAL FINDINGS

The following section is based on the researcher’s observations of the company, documents that were made available and interviews.

THE COMPANY

The company that is being researched offers a range of engineering products across different markets. These markets require complex systems that are to be delivered to the customer. The chosen department is dedicated and specialized to building systems in the company’s product range. This department is assigned its own building with over 100 employees ranging from different functions such as; sales, project managers, hardware engineering, software engineering, and commissioners.

PROJECT MANAGEMENT HANDBOOK

The following section is based on the company’s project manager framework which outlines how a project should be managed.

Project Risk Management

The company sees the purpose of risk management as being a way to identify potential obstacles and hazards to the successful execution of project. Risks within a project are seen as including technical, commercial, legal understanding and the relationship with different project stakeholders. One of the major key performance indexes used within the project success criteria is scope and contingency management effectiveness. The description given of this is that the project manager should manage contingencies and the product required during the project while maintaining the project to be on-time. It is of utmost importance that these risks are handled in an open and transparent manner to ensure that appropriate resources are allocated from all stakeholders as early as possible to mitigate risks for the successful execution of the project. This process should involve the company, the customer and suppliers.
Project Concept

In the beginning of the project concept phase it has been observed that project managers and the sales department have brief meetings in regard to the contract. These brief meetings are conducted to discuss the project specifications outlined in the contract written between the company and customer. The major issue discussed at the beginning of the meeting was the scope of the project. This was discussed in order to define the availability of resources and identify the appropriate internal team members required for the project. It is in this phase that a project charter is drawn up and the confirmation of the budget process takes place to be carried forward to the planning phase.

It is also noteworthy to mention that in standard projects, the sales department meets with a project manager after the contract is written. However, when the company considers a project as complex, the project managers usually like to step in and meet before the contract is finalized. They do this to offer their expertise in order to discover any early warning signs of risk that could affect them in later phases of the project. These meetings are then referred to as clarification meetings which include sales, project manager, the customer and end-user.

Project planning

Following the concept phase the project manager is handed the approved contract for further development. The company’s project management framework sets a standard for developing a project plan. It was during this phase that project managers established the time plan for the project as well as further assessing the proposed risk and define alternate strategies to mitigate these risks. Project documentation is required by the project management framework in order to set proper scheduling, budgeting, lists of deliverables and quality standards. It is also during this phase that the project manager is appointed the best available engineers to form the project team. The framework also states that project managers need to have a clear communication plan that is carried out so risk is mitigated.

Project Execution

During this phase the project managers put plan into action. Project managers begin communicating to each function the required deliverables, roles, and responsibilities within the project. The project managers then contact their suppliers with a clear scope of deliverables, prices, and time schedules. Once the supplier accepts the scope they begin contracting and building the necessary components to be assembled by the company. The
company framework states that fast effective action is needed if unforeseen risks are identified. In this stage, it is important for project managers to establish resolutions to arising problems in order to mitigate their effect.

**Termination Phase**

This phase is considered the business support stage that provides the necessary reviews and proper sign off of finances and deliverables. This is to ensure that the project is finalized and all specifications have been met. This is the stage where the project manager passes the project to the business support team. The business support team ties the knots and release all resources from the project so that they may be applied to a new project. Team members are also released in this stage and project closeout celebration may commence.

**WITHIN CASE ANALYSIS**

*The following section outlines four cases that outline projects that have faced contingencies.*

**Case One - The Standard Project**

Within this case the company had a customer who in turn was contracted by an end user. This type of situation is quite common for the company and the scope of the project and time schedule were routine. The project was therefore seen to be a standard and was treated as such throughout each phase. However, once the project manager had delivered the finished system the end-user refused to pay the customer. This in turn resulted in the customer refusing to make payment to the company.

The reason for this was because a component in the system had been damaged and no longer functioned which caused concern for the end-user. This became a major reason why payment was withheld and according to Respondent A can be quite common in projects:

“It can occur that the last payment is difficult to get. The reason is that they want to feel 100 percent confident the specifications have been met. Sometimes they discover something that does not work to the specification or broken parts.”
Managing the Project Risk

During the termination phase a key component in the system experienced technical issues and ceased to function. This became an issue for the end user and created concern regarding the quality of the component. When the component broke, Respondent A had to ensure that the customer was reassured and understood that this is a rare occurrence. In order to do so the company made another component that was delivered to the site and adjustments were made. The projects budget was not affected as each project has a contingency fund for issues such as these. This made it easier for the new component to be delivered right away with the changes.

Respondent A pointed out that contingencies for faulty parts are always factored as possible risk and therefore is relatively easy to fix in a timely manner. What can be difficult to plan, according to Respondent A, is the overload of resources to build the component quickly with the necessary changes and the increase in communication:

“We had to take the time and continually discuss the issue with the customer on a weekly to bi-weekly basis. We only have done this by email because with our customer English is a barrier.”

The reason behind emailing is because the customer prefers to read English rather than speak it. Emailing also provides Respondent A with documented verification of what has been discussed and decided by the parties. Respondent A pointed out the other reason that he prefers emails because he himself does not want to miss details that could be accidentally overlooked.

Respondent A did have a face-to-face meeting with the end user though this was towards the end of the resolution as a way to ease their concerns. The customer was not present in the meeting as neither party felt that it was necessary. The end-user had asked for the company specifically to build the system which increases concerns for the end-user when there is a damaged component.

Although the problem within the project occurred within hardware components Respondent A also briefly discussed the risks associated with software:

“Corrupt data happens though I am good at handling these situations. I am used to it so I do not increase the project meetings internally.”
Case Two - Retrofitting

Project Background

The customer within this case had purchased product over 15 years ago and had components coming to the end of their life cycle. Therefore, the customer returned to the company’s sales department and requested an upgrade to the existing product to make it current. The company’s project manager (Respondent B) received a new contracted assignment from the ‘sales department’ to retrofit new components to its existing equipment.

Respondent B received the contract from the sales department with the customer’s specification requirements, the project manager’s available resources, and budget. The project manager then planned out the whole project including a detailed time scheme and ordering components from suppliers. The project manager was allocated engineers from each function, hardware and software, in order to design the new retrofitted system and gave them the time schedule.

Project Risk and Contingencies Software Engineers

Initially in the project the sales department had contacted the lead engineer from software engineering project in order to estimate a time frame for this part of the project. Although the lead engineer was not involved in the project he estimated a time frame of 5 weeks.

However, once the project commenced there were no software engineers available to complete the software so an engineer from another function (commissioning) was brought in. The risk within the project was compounded because the new commissioner had to build a new software system from scratch. The company’s new system software did not match the parameters of the older system software due to the corrupt data files and outdated software as explained by Respondent B:

“We discovered that the software sent by the customer contained corrupted and outdated data. The only solution was to build a new software system from scratch.”

These issues resulted in the software department’s time frame extending from 5 weeks to 18 weeks. During this time the software engineer also lacked the proper equipment to properly

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1 The Commission engineers are responsible for overseeing the installation of systems
develop the software. Usually, an engineer is given multiple computer screens and a high-tech computer to carry out the programming needed for the retrofitting. Within this case the engineer was only equipped with a laptop, pen and paper. Respondent B discussed how the level of communication with the software engineer was quite minimal and therefore this problem was only discovered quite late on. In fact the software engineer only communicated to the function manager when a problem occurred. This resulted in three weeks being lost in the budgeted time. Respondent B believed that if he had pushed for more communication this time loss could have possibly been avoided:

“I would have immediately given him what he needed however, I was not told of the problem until 3 weeks after the problem was discovered. Some of these guys [the engineers] prefer to work more by themselves and can be a little difficult to get information out of.”

**Hardware Engineers**

Whilst the issues within software had put the project behind schedule the hardware engineer was well under budget and finished much earlier than the required deadline. Respondent B gives his reasoning as such.

“I communicated with the [hardware] engineer in a weekly meeting for around one hour. This is done because the hardware requires urgency to be done so that it can be shipped to its location.”

This view of the hardware department resulted in the project manager to implement a more blocked time frame which saved time within hardware engineering. The project manager along with the hardware engineer analyze and document the week by what has been done, what is going on now, and what has to be done next week. Not only are there weekly meetings though also a high level of communication on almost a daily basis through email and telephone.

Later in the project the customer wanted to add components to the retrofit. At first this was seen as a large problem that could affect the schedule and cost of the project. However, the project manager and hardware engineer managed to add the components. Respondent B believes that the hardware engineer was able to add this very quickly because of the regular communication and blocked scheduling.
‘We had a component the customer really wanted to have and therefore it had to be added, even though it was not in the quote. These discoveries seem to be happening late...We were fortunate enough because we were so far ahead of schedule this was not an issue.’

Case Three - Outside Software

Project Background

This case presents a situation that is quite uncommon for the company. Normally the project manager coordinates with the company’s hardware and software engineers to build a product system that is delivered to the customer. Within this case however the end user, who had contracted the customer, has requested that the software for the project is to be supplied by their local supplier. The company hesitated in regards to this request though the project was given the green light anyway.

The Project and Risks

The project team only contained hardware engineering as due to the local supplier providing the software there was no need for software engineers. Once the hardware had been built Respondent C believed that because of the close relationship between the two the end user and supplier could work out and clarify all the requirements needed for the software and therefore it could simply be installed:

‘We thought that there would not be a problem because the strong relationships between the end user and supplier and the end user and us. We thought this was adequate so we went forward with it. Once we received a quote we then added a handling fee but added no value to the product.’

However, once the project begun a number of issues arose surrounding the software. During the execution phase there was a lack of understanding of what was to be delivered. This resulted in the software being delayed and therefore a delay in the project as a whole. As the company usually develop their own software this problem had not ever been encountered before. When the company started delivery of the product the end user began asking for more features. The local supplier that the company bought the software from had started the work though this was no longer the same software that they described. The problem that
Respondent C had to deal with resulted in ongoing discussions with the end user and their supplier:

“We had to intervene between the end user and their supplier and it became difficult because we didn’t have the detailed knowledge, there was no good specification. I think it was never clearly described and they also asked for changed orders.”

The project manager had a false sense of security due to the reassurance from the end user. What is noteworthy is that even though a high level of risk was identified there was nothing done to mitigate the risk in the planning stages. It was only after the extra request of changes were made that the risk had finally emerged though there was no planning on how to mitigate them. Communication in the beginning of the project was non-existent until it was too late. This lack of communication can be seen to have led to poor planning and caused a misalignment of the how the software was designed compared to how the end user wanted it. Even when there was communication occurring there were some language and cultural differences. Respondent C continued further about the communication.

“This project was not time critical in the beginning so communication was very low in the beginning. Finally, when the problems have emerged then communication started bi-weekly via email...going back in hindsight, should have communicated with each other more.”

Once there was a problem the level of communication increased and the end user a project team had a meeting. The company, along with the end user and their supplier met to clarify what was to be delivered. A senior software specialist was present in order to clarify and make sense to what still needed to be delivered. Even after this meeting a number of issues still existed and an increase in the number of emails and phone calls were used. Respondent C realized too late that communication needed to be ongoing. Added to this was the fact that communication happened in ‘waves.’ Meaning the end user and project manager would communicate frequently for one month and nothing for the next two. This was an ongoing issue throughout the project.
Case Four - Design Changes

Project Background

The last case was thought to fit within the company’s normal scope of supply and have clear specifications. The project manager (Respondent D) therefore conducted the project planning as normal and began building the hardware.

However, during the hardware build the project manager ended up experiencing many design changes. Not only were the design changes a challenge but the end user had also changed the delivery deadline of the hardware forward by 3 months. The project manager was therefore faced with a project that was at risk of going over budget and being delayed.

Managing the Project Risk

The project started with a clarification meeting with the customer which is a normal process to work out all the specifications. In this meeting the price and scope of the project had been agreed and a deviation list was implemented. The company also had the end-user tied into the customer’s agreements. These meetings are seen by Respondent D as helping to gain an insight into the customer and end user and establish communication early. It was during this meeting that Respondent D first saw issues within the project:

‘I then discovered from the meeting that communication between our customer and their end-user was a cause for concern. I decided to include more communication with the end-user rather than always going to our customer first.’

Although the end-user had a contract with the customer Respondent D felt as though they had not properly worked out the specifications. Respondent D then rechecked the project specifications with the end-user that were agreed upon by the customer. This resulted in another clarification meeting with the end-user. As a result of this meeting Respondent D decided to maintain constant communication, on a daily basis, so that clarity and responsiveness were not affected. The project continued to and the planning was organized following the company’s framework.

However, after the design phase the end-user started making numerous design changes which had negative effects on the project. The project was starting to go over budget due to the component changes. Respondent D explained that if end-users change the components after
the planning phase then costs become greater. As a result of this the available resources will have to be focused towards re-documenting, redesigning and refitting the new component:

‘Once, we sorted out the design change we continued as planned. But, the end user came back to us again with added design changes. A late design change becomes more of a problem. The costs of the project become even greater when you make such changes this late in the project’

Respondent D stated that following the changes the budget was at 30% over and as a result of this decided that increased communication had become a priority. The amount of contact between Respondent D and the end user increased to every few days to weekly in order to ensure that the component was still on track. Although the previous issues were related to hardware engineering they also caused problems for the software. The software engineers were forced to change the software because it no longer matched the new specifications sent by the end-user:

‘When in these situations it is good to increase contact with my engineers to make sure that solutions are happening very quickly. I like to go to the engineers in person to have a chat and discuss what is going on and how things are going in the project. I think this is good to do on top of weekly emails because it keeps projects on track.’

Respondent D elaborated that he has these face-to-face meetings because they keep projects from being pushed aside by the engineers for other projects. As the engineers also have other projects going on they are unable to focus solely on one project at a time. Therefore, Respondent D believes these check-up meetings during the duration of the project are a benefit so that risk is mitigated.

In conjunction with the design changes that were made the end user then required that the project delivery date be moved forward. Compared to the original specification the project would have been 6 weeks early though due to the request for early delivery the project would have been late. In order to meet the new deadline Respondent D increased contact to both departments to a daily basis.
AGILE ANALYSIS

The following section is based on questions (appendix B) asked by the researchers to gauge whether the principles of agile project management could have been used in the cases.

Respondent A explained that all project managers are encouraged to seek advice from the senior project manager. This communication is used in order to better discover possible issues and also solutions to issues.

“With high technical risk projects we need to focus more on mitigating the risk. Our senior project manager gets involved with our bigger issues. But with that said he does not actually take over a project.”

Respondent A goes on explaining that highly technical projects usually mean developing something new that does not currently exist on the market. This brings lots of uncertainty and time delays in the project. Often these highly technical projects and changes require a different approach and creativity in order to meet the specifications. Respondent A explains that in his experience following the framework in this situation will not work. If a standard project brings problems then outside solutions may be necessary:

“We have to follow our guidelines [on standard projects] otherwise if changes come then it is quite different how to handle our projects. Some project managers want to get more involved for better control.”

Respondent D agreed that increasing communication may have helped the planning and design issues earlier on though feels that each project has their own issues that need to be dealt with:

“In hindsight the outcome may have been better but, it is hard to know if the outcome would be different”.

Respondent C believes that increased communication and short term planning would have helped in the case. The project would have also benefitted from a clearer picture in the beginning and throughout the project:

“It would have been an advantage to clarify our time, planning, and scope. In this particular case it could be a benefit to bring in the focus we have been lacking. Maybe because I communicated less in the very beginning of this project it was the reason for why our original plan did not work.”
CROSS CASE ANALYSIS

This section is based on similarities and differences between what is described in the literature review and what the company analysis revealed.

THE STANDARD PROJECT

Following the results of the case analysis, it is first important to define what is perceived as a standard project. The company framework of how to execute projects does not distinguish between different project types or permit different methods outside of the company framework. The project managers have described a standard project as one in which the customer makes an order that fits directly within their core scope of supply. This section focuses on how the companies project risk management is suited to the contingencies faced by project managers within standard projects.

Contingencies

One of the main aspects within the company analysis concerns how contingencies affect project risk management. The proposition of contingencies in project management is that if the task is well understood prior to its commencement much of the activity can be preplanned, in practice this would result in lower levels of integration in low-risk projects (Barki, Rivard, & Talbot, 2001). This is in line with the company project management framework. The framework believes that effective planning around contingencies from the outset of the project will mitigate the risk throughout its entirety. Case One was that of a standard project based on the experience of many projects before. This suggests that the previous experiences of the project manager results in a cut back on the level of integration with other departments because these roles are merely being redefined. This also helps the project manager to be aware of contingencies that commonly arise that result in reduction of any arising risks.

Thamhain (2013) elaborates the occurrence and degree of impact may not be known in the beginning. This holds true in Case One of the project manager not knowing the uncertainties. Once again, the likelihood of occurrence such as Case One’s design failure, has been experienced before. Therefore, the project manager framework addresses how the project manager should handle such contingencies. This has been done by documenting the event so
that future projects (such as Case One) will be ready to mitigate this arising uncertainty properly. This example is therefore reaffirming how standard these projects are in terms of facing contingencies and how the current project risk management is well suited at handling them.

Another point of interest within the company analysis is the phases that occur during projects and the structure of project teams. The linkage of these two areas and how the company carries out their risk management provided a number of insights as each of the the phases carry their own level of risk. According to Ward and Chapman (1995) traditional project management consists of four phases; concept, planning, execution and termination which, must have a detailed plan. The company’s project management framework has also been broken down into these exact phases in their project life cycle. Case One can be seen to give evidence of how the planning of phases can help with the mitigation of risks and contingencies that are faced. This indicates the importance of phases within standard projects and how they help the project manager in planning out the project.

**Concept Phase and Risk**

Lemaitre and Stenier (1988) believe that during the concept phase it is important that the project fits in the company’s scope in order to establish the project's level of analyzed risk (Lechler, Edington, & Gao, 2012). The company’s project management framework states if the project is not within the scope then the project is not accepted. Case One emphasizes the importance of identifying any early warning signs of risk that could affect them in later phases of the project. This indicates that company realizes the importance of having clear scope and well defined specifications in order to establish a plan that mitigates risk and can handle any contingencies that occur within the project.

**Planning Phase and Risk**

According to Ward & Chapman (1995) basic design is needed so that a time schedule for the project can be made. Therefore a good time schedule is important so that the resources can be allocated effectively (Turner, 1992). The Company’s project management framework requires this exact thinking for effective planning and allocation. This shows that a company needs to have effective planning so that arising risks can be mitigated.

Adams and Barndt (1988) say poor planning will arise to uncertainties in the execution phase. However, Case One shows the benefits of contingency planning because it mitigated a risk in
the execution phase. Respondent A say that the project management framework already covers an arising uncertainty such as this because it has happened some times before. This can then be see that certain risk are planned because they themselves are considered standard and quickly solved.

**Execution Phase and Risk**

In this phase Ward & Chapman (1995) explain the project manager’s responsibilities of monitoring and controlling the project. This is done by rescheduling, reallocating, communicating with stakeholders and manage unforeseen situations. The project manager in Case One has come across an unforeseen situations in which the component had failed to operated due to damage. He then rescheduled and reallocated resources to provide another component and increased communication with the customer to ensure that everything has been fixed and that this situation is under warranty. This event is mentioned because it can apply that the Company’s standard projects fit Ward and Chapman (1995) and Thamhain (2013) thought that clarity and planning can mitigate risk in execution.

**Termination Phase and Risk**

Ward & Chapman (1995) make the claim that deliverables that have not been approved by the end user is not a risk. It is rather considered ‘unmanaged risk’ from the previous phases. Case One has shown correlation that no final payment was received because of the component representing lack of quality in the end-user eyes. Therefore this implies that the project manager has not conveyed to the end-user that the quality is good enough.

It can be seen in the standard project that the project risk management process has matured over time. When project managers face the same arising uncertainties from previous projects, they ultimately learn how to create stronger concept and planning for the next project. This in turn strengthens the project execution phase by having a well-covered plan to mitigating experienced risks. This is mainly due to the fact that the projects’ scopes of supply have little variation from one another. It can also imply that most uncertainties do not vary from project to project. This leads to the idea that a traditional project management method will not only sustain but also strengthen the project risk management process for further standard projects to come.
Communication Risk

Communication risk is considered to be a large aspect of project risk management because of the choice made in sharing information both internally and externally (Koskosas, 2008). Dimitroff et al. (2005) suggest that risk management should promote multiple channels of communication. One of the key performance indexes within the Company framework requires that a clear communication plan be drawn up to define the way communication is to be shared and through which channels.

Case One shows that the project manager followed the company project management framework by having a clear communication plan to ensure that communication risk mitigated. The project manager does not speak to the customer’s very often until a problem occurs. In order to mitigate the risk that occurred in Case One the project manager discussed his need for the new component during their bi weekly meeting. This indicates that a good communication plan is affected by the quality of information rather than the frequency of the communication. Futhermore, quality of communication rather than quantity was also important in fixing the language barrier. The project manager’s end user needed the time to read and translate the emails in order to overcome what Ferrante (2010) would see as being a potential risk in misalignment of communication.

According to Thamhain (2013), within project risk management one of the major hurdles to overcome is the ability to promote desired behavior. The above information regarding what the company requires of communication within projects and how project managers use communication outlines the fact that there is an understanding of this desired behavior. This indicates a strong fit between the company’s ability to overcome communication within their project risk management.

The information above has shown that if the standard project holds its course in terms of planning then so does the communication between the project manager and his/her stakeholders. While this standard project experienced a mishap with the component, the contingency plan was already in place to solve this issue. This in turn means a communication plan was already designed for this situation and then acted out. Just as phase risk planning is made to mitigate risk in execution, communication misalignment is also mitigated based on a well-designed communication plan.
THE COMPLEX PROJECT

This section focus’ on how the companies project risk management is suited to the contingencies faced by project managers within complex projects.

According to Barki, Rivard, & Talbot (2001) the basic proposition of contingencies within project management is that if the task is well understood prior to its commencement much of the activity can be preplanned. However, in Cases Two and Three the sales department and project manager in the conceptualization phase claimed not to have a good understanding of the project. This indicates that within such projects undertaken by the company the risk of contingencies will be quite high. As the task is not well understood the typical preplanning that is required by the company’s project management framework is hard to complete and will not cover all risks that could occur in the project.

This lack of understanding implies further into Barki et. al. (2001) that as the task uncertainty increases, a greater amount of information is overseen among decision makers in order to achieve a desired level of execution. The execution phase in the project life cycle is usually where most risk and uncertainties come to the surface according to Ward and Chapman (1995). Thamhain (2013) elaborates that relatively unknown risk which occurs in the execution phase usually stems from communication failure and poor planning of the project.

In Case Two, the project manager planned for 5 weeks for the software to be completed. However, this took 18 weeks to be completed. The project manager believed this misrepresented time needed for delivery was due to the sales department not getting right information. This implies from above theory that a lack of basic understanding there means a lack of planning for the project manager to execute a project effectively. The strict preplanning that is required makes it difficult for the project managers to deal with such contingencies in the execution phase.

In Case Three, the project manager believed that poor communication resulted in a lack of clarity with the external stakeholders in the concept phase. This then resulted in a misalignment in the execution phase. What made this worse was that the project manager saw that this software could bring misalignment though never implemented specific planning around mitigating the risk. This resulted in when the end-user required more from the software the project manager had no clear steps on how to handle the contingency. This is seen to be a key reason as to why the case has remained open for a year longer than it should have been.
In practice the theory (Barki et al., 2001) states project managers need high levels of integration in high risk projects. In Cases Two and Three, the contingencies of the project were stated to not be fully understood. Therefore, it can be implied that greater information need is required in order to implement effective project risk management that is capable of mitigating the risks caused by contingencies. However the empirical evidence shows that the project managers did not communicate enough to start planning on how to mitigate the unforeseen risks.

It is stated by Koskosas (2008) that when information sharing is unreliable or irresponsible the project will be negatively affected. This proves to be in line with Case Two and Three that both project managers did not fully follow their responsibilities with an effective communication plan as the project framework states they should have done. This implies that the project management framework, and project managers, should adopt a more project-specific approach to project management (Shenhar, 2001). This especially would have helped Respondent C’s project of not treating the case as if it was a standard project. It can also be seen to have benefits for the contingencies faced in Cases Two and Four. Even though the risks were not seen at the outset of the projects once the contingencies occurred a more project specific approach should have been adopted.

In Case Two, the project faced unreliable information based on the time it would take to complete the software of the project. In Case Three there was irresponsibility of knowledge transfer because the company did not clarify early between the local supplier’s software and the end-users specifications. This implies that a lack of communication will result in a project that cannot properly meet the contingencies and in turn affect the project risk process.

Communication risk is considered to be a large aspect of project risk management because of the choice made in sharing information both internally and externally (Koskosas, 2008). Dimitroff et al. (2005) suggest that risk management should promote multiple channels of communication and establish groups to work on project risks. In hindsight within all Cases the respondents claim that they should of increased communication in order to help mitigate their risk both internally and externally. It can be seen that the project managers have not been communicating enough with the sales and software departments. This lack of communication has led to the increased difficulties faced in the three complex cases. The increase in communication, both internally and externally, can be seen as a way of mitigating the effects of the contingencies in each project. Had communication been increased Respondent B would
have known about the difficult working conditions faced by the software engineer and could have reallocated the appropriate resources. Case 3 suffered from a general lack of communication and would have benefitted from more external communication where the software specifications could have been properly established.

As mentioned within standard projects, traditional project management is broken into four clearly defined phases. Cases Two and Three show that within complex projects the planning outlined by traditional project management creates difficulties for the project manager to effectively handle contingencies. This implies that a strict framework of how a project should be planned and executed increases the possibility of the project being negatively affected by contingencies and decreases the effectiveness of project risk management. Giving the project managers the flexibility to manage their projects using alternative methods can be seen as offering benefits in regards to handling contingencies that occur during a project.

OUTCOMES

Based on the previous analysis of both standard and complex projects, a number of issues have emerged regarding how appropriate the current project risk management is for complex projects. The following section draws on three separate areas of research which the authors combine in order to recommend an alternative method to enhance the company’s project risk management founded on what the literature offers.

The UPC Model

The UPC model, developed by Shenhar and Dvir (2007), is designed to help project managers to select the appropriate management method depending on the contingencies they face. As of current the company is handling all projects (complex or not) as traditional method which has caused issues.

The company framework has very clear guidelines regarding how to handle uncertainties however the analysis of the cases has shown that the project managers, except for Respondent D, have often struggled with contingencies. All cases faced uncertainty and every project manager implemented solutions to try and mitigate the risks although these solutions all possessed the same characteristics rather than being specifically tailored.

As project complexity can be seen as a result of the project scope, complexity within a project can also be affected by the complexity of the organization. The analysis of the Cases indicates
that all project managers admit that complex projects were difficult to manage. However, due to the project management framework the project managers were left with no alternative courses of action. Rather they carried on as if they were standard projects and had the issues of complexity in the back of their mind.

The third factor, pace, encompasses the urgency of time goals. What is of great interest to note is that all project managers look at pace within hardware engineering because the hardware is required to be completed in order for shipping. However, the urgency of software engineering is neglected within the cases.

It is argued by the researchers that the Company should use the UPC model on all projects in order to classify them as either standard or complex. By measuring the levels of uncertainty, complexity and pace of each project the project managers will be better informed as to whether the project is standard or complex and thus how to best execute the project and which team structure to select.

**Team Structure**

Following the outcome of the UPC analysis it is suggested by the authors that the Company matches their team structure to the alternative that is required by the type of project.

As outlined by Clark and Wheelwright (1992) within an organization a prevailing team structure mode will exist which dictates the procedures and systems of projects. The company currently manages their projects according to the lightweight team structure (seen on next page) which is seen as the best alternative for the standard projects that the company undertakes.
However, for complex projects the researchers propose that the company make use of the heavyweight team structure, as illustrated below. The project managers in complex projects would benefit from the increased influence they would have across all functions.
Researchers own creation based on team structure developed by Clark and Wheelwright (1992)

Heavyweight team structures are seen increase the integration, contact and communication of project members which was seen as one of the major issues in the company’s complex projects. It is also stated that the improved communication and coordination results in a project that better meets customer requirements.

The weakness that is generally made of the heavyweight structure is that because the project team is given a larger scope to operate within they may overstep their limits. The researchers argue that the company’s project management framework will prevent this from happening as the scope of projects is clearly defined.

As previously mentioned the current structure used by the company is lightweight. What is interesting to note is that within the project management framework project managers are given the authority outlined in the heavyweight team structure though execute their projects following the lightweight team structure. The researchers argue that the project managers would greatly benefit from matching team structure to what is required by the type of project. This is especially important in projects that do not fit into the standard type that the organization usually carries out. What is important to ensure is that multiple structures can coexist and work to strengthen the organization in the long term.
Agile Project Management

Once a project has been classified as complex and the heavyweight team structure is selected the researchers propose a specific project management method for the structure which is outlined below.

According to the literature agile project management is seen as creating adaptive project teams that can respond rapidly to changes in their project’s environment. (Leybourne, 2009) Through the use of agile project management the project managers in each of the complex cases would have been able to quickly adapt to contingencies in their projects. As agile project management encourages stripping away as much of the bulk as possible quick responses to contingencies, such as changes in user requirements and accelerated project deadlines, are possible.

As previously mentioned Cervone (2011) argues that within agile project management, risk is minimized by focusing on short iterations and direct communication with stakeholders during the process takes the place of creating large amounts of project documentation. A result of this is that agile project management focuses on defined deliverables and therefore outputs are closer to customer requirements. This is seen as being imperative to the successful completion of the complex projects that the company faces. As stated by Respondent C an ideal method would:

“Have been an advantage to clarify our time, planning, and scope. In this particular case it could be a benefit to bring in the focus we have been lacking. Maybe because I communicated less in the very beginning of this project it was the reason for why our original plan did not work.”

As a part of agile project management the project managers would host frequent (every week), short meetings between the project team. These will be used in order to encourage and enhance frequent communication within the team. In their findings Ribeiro and Fernandes (2010) found that agile teams had increased flexibility, speed, leanness, responsiveness and increased opportunities for learning. Another reported benefit of agile methods is that changes become easier to implement and cost less. What is of great interest to note is that all project managers within the case study handle hardware development with an agile type method. All project managers have frequent meetings, around once a week, with the hardware engineer on their project and see this as helping to speed up hardware development.
Another point of note is that even though agile methods emerged from software development all project managers have very limited contact and communication with the software engineers. This was seen in a project plan that was outlined for Case Two (as seen in the below diagram). Within the case the project manager had planned a number of short iterations for the hardware engineering though had left software engineering as a largely unplanned block. The fact that agile emerged from the principles developed within agile software development (Cockburn, 2001) though is used by the company for hardware development indicates that the increased use of agile may be relatively easy to implement. In addition to this the company’s ability to create adaptive project teams that can respond rapidly to changes in their project’s ecosystem (Leybourne, 2009) will be helped through the use of the heavyweight team structure.

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*Researchers own creation based on company project plan

It is recognized that problems in adopting agile project management exist, although the researchers believe that these can be overcome by the company. One such difficulty is the ability to get the right people involved. Another common criticism is that agile methods will work only when the performance requirements are explicitly stated at the outset of the project. The analysis of the Company’s project management framework requires that both of these points are covered at the outset of the project. Therefore as long as the requirements of the framework are followed these criticisms can be seen to have a marginal effect on the
company. A further criticism is the usefulness of communication between the customer and team. Specifically, the fact that indirect links between customers and developers through intermediaries is less effective than direct links. This point is seen within Case Three and could pose a problem for the Company though can be overcome through increasing the amount of communication with the end-user rather than the customer. Within Case Four although the prospect of increased communication and short term planning was embraced when the principles of agile were asked Respondent D stated:

“In hindsight the outcome may have been better but, it is hard to know if the outcome would be different”.

As previously stated the general consensus amongst the literature (Leybourne, 2009; Cervone, 2011; Misra et al., 2012, Thambyn, 2013) is that agile methods are not a ‘universal best practice’ though rather can be a useful practice in the right circumstance. The authors agree wholeheartedly with this opinion and do not suggest that agile project management will fix all of the issues associated with complex projects. Rather, that according to the literature agile methods can enhance the company’s project risk management in relation to how contingencies are handled. Also the researchers believe that if the use of agile project management is preceded with an analysis of the UPC model and the selection of an appropriate team the ability to mitigate risk will be increased.
CONCLUSION

The purpose of this paper was to determine whether the company’s project risk management is suited to the contingencies faced by project managers. In order to do this a literature review was used to develop areas of research. These helped to determine that the company faces both standard and complex projects. The result of the company analysis helped in determining that within standard projects the company’s risk management is well suited to contingencies though within complex projects it is not.

The analysis reveals that the company has a well-defined framework for handling contingencies. The lightweight team structure employed by the company together with four carefully planned phases provides a solid platform for project execution and risk management. The level of communication within standard projects and the company’s ability to handle risk in each phase also provides a strong fit which leads to project success. Therefore, within standard projects the company’s current project risk management are seen as being suited to the contingencies faced by project managers.

On the other hand, the company’s project risk management struggles to deal with contingencies in complex projects. The company fails to properly make the distinction between standard and complex projects which leads to the use of the same project risk management in both. Also, the lightweight team structure used by the company makes it hard for the project managers to arrange the high levels of communication that are seen to be required in complex projects. Similarly, the requirement of pre-defined phases creates difficulties for project managers to handle contingencies in a timely manner. As a result of this it can be seen that within complex projects the company’s current project risk management is not well suited to the contingencies that the project managers are facing.

The second research question of the paper addressed what the literature offers for ways to enhance the company’s project risk management in regards to the contingencies faced by project managers. Following a detailed literature review the authors proposed an alternative method of project management. This method was based on the outcomes of the first research question and the identification of a need to deal with contingencies in complex projects. The suggestion made use of the UPC model to help the company determine whether a project should be classified as standard or complex. Once this classification has been made the
The company should select the appropriate team structure for the project with heavyweight being the best option for complex projects. The authors then proposed agile project management as a method for managing the heavyweight team structure. This method is proposed as it purports to make it easier to implement change, increase communication, focus on deliverables and increase speed and flexibility. As these are the main issues that contingencies are seen to have caused within complex projects, it is therefore important that the chosen method has the ability to mitigate as many as possible. According to the literature research conducted, this suggestion is a way to enhance project risk management in regards to contingencies.

**IMPLICATIONS**

From the research, a number of implications can be drawn. Although the authors attempted to gain a wide perspective from the various cases and company framework, the conclusions are based on a limited sample. Therefore, in order to determine if the conclusions made are true outside of this company or project setting, there is a need to collect data from a wider variety of cases and possible sources.

This paper combines aspects of three separate theories, namely UPC model, project team structure, and agile project management, in a new way that proposes a new concept. Further studies into this area are needed to determine if in fact what the literature proposes in this case does enhance project risk management.
REFERENCES


Appendix

Appendix A – Interview Times

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Appendix B – Interview Framework

1. Can you describe the case
2. Can you briefly describe the incidents or problems that occurred in the case
3. Did this project have a higher number of contingencies than other projects
4. How did you plan the project
5. How often did you speak to the hardware/software engineers
6. What specifically did you plan in each phase
7. What contingencies occurred in each phase
8. How did this project compare to a standard project
9. Could increased communication have helped with the contingencies
10. Could the case have benefitted from less detailed and strict planning