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Project Quality Management for IT Company

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Abstract

Recently, many surveys conducted by Information Technology companies and institutions have dealt with project management. According to their results, quality in project management is degrading due to continuous changes in the business requirements. Therefore, companies are compromising with the quality or schedules in project deliveries, and this may have had an impact on their position in the global market. Quality improvement in project delivery is a topic of common interest. The purpose of the improvement is to achieve the objectives of the project, cause the least possible quality defects and prevent risks in the project delivery schedule. The customers are seeking high agility in project management, which means the ability to adapt to new changes quickly.

The project quality management model was applied as the main theoretical framework. The literature review was related to the concepts of agile project management and project quality activities (PQA) in order to find certain quality processes, milestones or checklists that could be integrated with the project model to improve overall quality. Given the nature of the research objectives, a qualitative research approach was selected. For a deeper understanding of the topic, a multi-method case study was conducted in the case company. This included an internal document analysis and two expert interviews, of which one was conducted individually and one with a group of three persons.

The results revealed that a tailored project management methodology which consists of best practices from the standard methodologies and aligned with the company strategy will improve quality significantly. In addition, a lean project model integrated with quality milestones and light weighted checklists was considered useful for handling the daily issues in project management. The study also revealed that there were no universal lists of quality processes or checklists ensuring that the project would meet the quality criteria. Further research could look into the idea of a Project Management Office (PMO), which is an important and widespread phenomenon of organizational project management globally, and examine how quality is managed and what the practical implications and challenges are.

Keywords/tags (subjects)

Project management, Quality management, Risk management, Project Management Office

Miscellaneous

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LIST OF ABBREVIATIONS

PQA	Project Quality Activities
SME	Small-medium size Enterprises
IT	Information Technology
EVA	Earned Value Analysis
EVM	Earned Value Management
AEVM	Agile Earned Value Management
PMI	Project Management Institute
PMBOK	Project Management Body of Knowledge
PMO	Project Management Office
NMT	Nordic Mobile Telephone
PTT	Post, Telephone and Telegraph
ICT	Information Communication Technology
PSTN	Public Switch Telephone Network
BSC	Balanced Scorecard
PQM	Project Quality Management
PPM	Project Portfolio Management
KPI	Key Performance Indicator
SLA	Service Level Agreement

1 INTRODUCTION

The information technology (IT) marketplace has become more global, service-oriented and the client's expectations are high. Due to competitive economic conditions, many IT organizations have found that it is increasingly difficulty to compete. In order to survive in the global business environment, it is necessary for organizations to find different ways to improve quality and efficiency in the project management in order to gain a competitive edge. (Zeng, Lou, & Tam 2007, 30.)

Lately most of the IT companies have been heading towards more flexible and adaptive project management processes and practices. The emphasis is on the removal of communication barriers in the organizational structures by establishing cross-functional departments. (Fernandez, & Fernandez 2009, 10.) According to a Project Management Institute (PMI) survey conducted in 2015, agile, incremental and iterative practices are more frequently used in project management. Moreover, the use of these practices continues to rise, with 38% of organizations reporting frequent use, up 8% points since 2013. However, it is no surprise that highly agile organizations achieve a 75% better project outcome in comparison to low agility organizations with 56%.

Based on Standish Chaos report (2015), the average of 16.2% of software projects were completed on time and budget. Further results indicated that 52.7% of the projects cost 189% of their original estimates, and 31.1% of the projects were cancelled before they were completed.

Flexibility and adaptability in project management are desired by project based organizations. The organizations may face several problems in handling global projects due to the project teams being located in different locations and time zones and due to the project managers having to deal with cross-cultural and language differences. In today's global economic conditions, project quality management has become a necessity for organizations wishing to remain competitive in the IT market. According to Atkinson (1999, 337), quality is a phenomenon, it is an emergent property of people's different attitudes and beliefs, which often change over the development life-cycle of a project.

In earlier decades, the experts in the area of project quality have described quality as follows:

- *Conformance to requirements (Crosby, 1979)*
- *Sometimes the expectations even have to be exceeded. The customer should be delighted (Kano, 1984)*
- *Quality in a product or service is not what the supplier puts in. It is what the customer gets out and is willing to pay for (Drucker, 1985)*
- *Fit for use or purpose (Juran, 1988)*
- *The quality of a product (article or service) is its ability to satisfy the needs and expectations of the customer (Bergman, 1994)*
- *The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs (ISO9000:2000).*
- *Quite simply, the company must survive, compete well, and constantly replenish its resources for growth and improvement through innovation and research (Deming, 1986).*

1.1   Importance of Quality in Project Management

Quality is a central element of project management along with three main pillars: time, cost and scope. Quality is a critical and the most important factor that may affect the project completion schedule or budget if quality is not planned in advance or the level of quality is not agreed with the customer (Goswami, 2015). According to Liberatore and Johnson (2013, 518), the value of a delivered project from a customer perspective can be measured by the level of quality associated with it. The purpose of project quality management implementation is to achieve the objectives of the project, prevent risks in the project delivery schedule and cause the least possible difficulty.

In earlier decades, many IT companies conducted studies and surveys in collaboration with business schools and institutions in order to determine the causes of a project failure and in order to improve the practices and policies in the project management. Mckinsey & company conducted a study on large scale IT projects with the University of Oxford (2012). The outcome of the study was that on an average, large IT projects exceeded their budgets by 45% and their schedules by 7%, while delivering 56% less value than predicted. The main cause of failure was that the users and stakeholders did not participated in the daily or weekly project activities.

A survey conducted by IBM (survey of 1500 change management executives in 2008) stated that the biggest barriers in project success were listed as people factors: changing mind-sets and attitudes – 58%, corporate culture – 49% and lack of senior management support – 32%. According to a Gartner survey (2012), the most common reasons or causes of project failure were functionality issues, the completion of the project being substantially late and quality issues as shown in Figure 1 below.
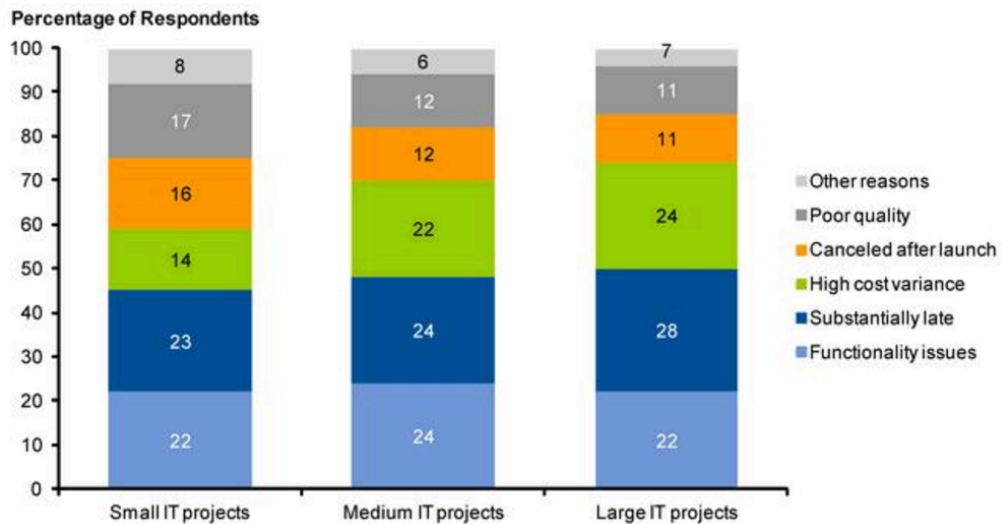
Figure 1. Why Project Fail

(Gartner survey, 2012)

In earlier literature reviews, the authors underline that the level of quality associated to project delivery depends on the choice of methodology in the project management. According to Wrike statistics (2015), projects meet 68% of their quality standards when organizations use a project management methodology and a smaller percentage without any methodology as shown in Figure 2. Moreover, project success is measured 15% additional when organizations produce high-quality deliverables.
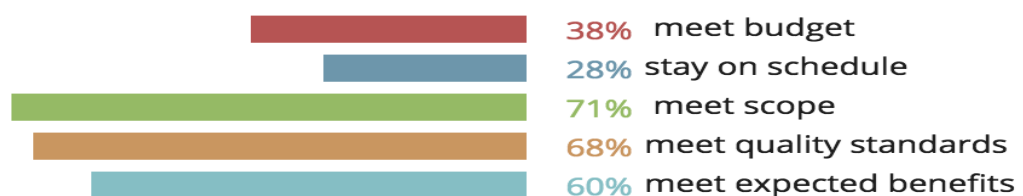
Figure 2. Organizations that use a methodology

(Wrike statistics, 2015)

1.2   Research Motivation

The broader relevance

In the global marketplace, economic competitiveness is a driving force. IT organizations are forced to be flexible and adaptive in their project management processes in order to sustain in the competitive market. The customers' expectations are increasing day by day because products and services are international and easily available on competitive prices. The organizations are focused on operational costs to gain competitive edge by automatizing their testing tools, streamlining development processes and improving project management practices (Aarseth, Rolstadas & Andersen 2013, 103).

Lately, IT organizations have found their revenue and customer satisfaction declining due to the lack of quality in their products or services. It has become a major challenge for organizations to execute a wide range of projects in distributed locations and in the middle of cultural differences (ibid.107). Some of the organizations are adapting project management methodologies in order to overcome the quality issues and thus improve the project delivery schedules. However, many organizations are afraid to adapt project quality activities or methodologies because of significant investment in defining the project management process and model (Gorshkova, 2011). The overall relevance and primary incentive is to determine necessary quality practices and processes in agile project management in order to improve the total earned values and identify the risk factors in the project management.

The relevance to case company

The case company "Qvantel Finland Oy" is a global 20-year-old and fast growing privately owned IT company in Finland. The company is focused on acquiring new customers by selling their digital frontend BSS products in the global market. At the same time, the company is focusing on increasing the revenue from the existing customers' operation teams by providing excellent products, services and support based on their daily needs to remain competitive in the market. This is a major challenge for the company to focus on the delivery teams and existing customers' operation teams at the same time. The company has been progressively increasing its

staff in different geographical areas and this is leading to a situation of projects in distributed locations with cross-cultural differences.

However, this case study was about to investigating possible quality improvements and practices in project management for one of the customer operations teams. The primary location of this operations team is Finland, but some of the project activities, such as development and testing are also managed from the Asia Pacific and European countries. The company delivers approximately 40 projects every year with more than 50+ resources. 50% of the projects are small size (1 month), 30% of projects are medium size (2 months), and the remaining are large size projects (more than 2 months). In addition, the operations team is responsible for delivering small or medium size enhancement development activities and platform improvements.

Lately a customer operations team was struggling with quality related issues in their project deliveries. Some of the projects failed to meet the delivery schedule or customer expectations. There were possibly one or many reasons for the project failures and it was recognized that insufficient quality processes or aspects were included in the project management model.

Without a quality process in the project management, a company cannot deliver the top range of services or products. Quality is an essential aspect of a service provider who wants to advance long-term relationships with customers. Good quality also fills the customer expectations and improves customer satisfaction, which strengthens the company's position in the global market. Quality is seen as an important competitive advantage in many organizations.

On its 20th anniversary, the case company had declared customer values as being more concrete and valuable for their customers. The case company emphasizes these values in every one of their improvement programs. They also emphasize educating new employees to build trust towards the customers.

$$Competence + Commitment + Care = C3 = Trust$$

The personal perspective

The key motivation towards this research topic was the author's increasing personal interest and career aspirations in the area of project quality management. It is important to understand the customers' requirements, to interaction with the

stakeholders and map their expectations.

According to my role and responsibility (Solution Manager & Architect) in the customer operations team, I am equally responsible for quality improvements in project management processes. Quality starts from the good requirements and proper project planning. The quality standards should be agreed with the customer in advance, in other words, what level of quality is expected based on the cost and schedule of the project. Quality has six main factors that have to be followed in every project: good planning, appropriate communication, managing stakeholders, good measurement, constant review and acting early.

1.3   Research Questions

As described above, quality is a central part of the project management. The success of a project is directly associated with the quality involved in the project management. In the IT industry, most of the projects are delayed due to uncertainty in the software technologies or continuous changes in the business requirements at later stages. The companies are tended to be flexible and adaptive with the changes in the requirements. However, the requirements may cause risks in the project delivery schedule unless they are examined properly.

Several quality related problems are unique to projects, and they are difficult to foresee or measure. Sometimes quality issues may delay the project schedule, increase the budget, or it may happen that the project is delivered on the agreed schedule and cost, but unfortunately it does not meet the customer's business needs. Therefore, in both cases the project manager has managed to deliver a failed project.

The purpose of this research was to investigate if and how the quality processes and checklists would improve the project management and standardized in the project model in the case company. For achieving this, the research sought to answer the following questions:

- How can quality activities help to identify the risks factors in project management?

- How can quality control and assurance improve the total earned values in the project management?

However, earlier studies have stated that there is no universal list of quality processes or checklists to ensure that project meet the quality standards. However, project managers can agree with the stakeholders about the level of quality expected in the project. Quality control and assurance are the most important processes in the project quality management. If the quality control or assurance do not meet the criteria, then it might impact on the earned values in the project management.

1.4 Structure of the Research

The thesis has five main chapters as described below. The Introduction chapter is followed by chapters containing the literature review, research methodology, research results, and the research report is concluded by the discussion and conclusion chapters. The main chapters also have sub-chapters for elaborating specific issues relevant to the research topic.

Chapter 1: The first chapter starts with an introduction to the research. This chapter focuses on the topic of the thesis i.e.: project quality management and its relevance to broader audiences, companies and their personnel. This chapter also introduces the case company "Qvantel Finland Oy".

Chapter 2: This chapter presents a literature review. Firstly, it outlines the key concepts of the research topic and ends with the supporting theoretical framework. In this study, a wide range of previous literature reviews, theories and empirical fundamentals were studied.

Chapter 3: This chapter deals with the research methodology. The qualitative research methodology was chosen to conduct the research. Semi-structured interviews were conducted for a deeper understanding of the issues and for collecting the appropriate data. This chapter also discusses the validity and reliability of the data.

Chapter 4: This chapter focuses on the research results. The author aimed to gain answers to the research questions that would hopefully be beneficial from the case company perspective and to other project-based IT companies.

Chapter 5: The chapter summarizes the main findings and final conclusions and how they answer the research questions. This chapter also presents suggestions for future research.

2   LITERATURE REVIEW

This chapter presents a review of literatures which is related to the concepts of project management and project quality activities (PQA) to improve the overall project performance. This chapter describes the difference between traditional and agile project management and their challenges and benefits.

The chapter starts with key concepts of the research. Furthermore, it discusses project management methodologies, how a critical risk analysis improves the project schedule, how quality monitoring and control improve project success rate. The chapter concludes with a theoretical framework for the research.

2.1   The Key Concepts

The following key concepts are discussed in the study: agile project management, challenges in global project management, quality activities, risk evaluation and earned value in project management.

2.1.1   Traditional vs. Agile Project Management

In the last few decades, big organizations or small and medium-sized enterprises (SMEs) have been changing from a hierarchical approach to project management in order to become more collaborative and knowledge oriented. Due to increased competitiveness in the global market, there is a need for project managers to increase flexibility in the project management processes in order to adapt to the constantly emerging challenges and opportunities (Fernandez, & Fernandez 2009, 10). Traditional project management follows a liner strategy that consists of dependent, sequential steps that are executed in the project life cycle (example: water fall model) but without any feedback from the customer. The project outcome is released in the last phase of the project. Moreover, traditional projects are clearly defined with well documented requirements and features that are well understood (ibid., 11).

The challenges that all companies face in a quickly changing business environment is staying competitive and increasing market share. As the traditional project management approach is linear therefore, it is difficult to adapt to the changes in the

ongoing project and this might lead to failures in responding to aggressive customer requests (Papadopoulos 2015, 455).

Traditional project managers manage their projects based on the three main pillars: cost, scope and schedule. Other project aspects, such as metrics and variance are measured against the planned baselines. Traditional project managers prefer to tackle the risks in the beginning by preserving time and cost in the buffer. The major benefit of traditional project management is that it can be handled and distributed geographically because of well-defined requirements and other supplementary documents (Fernandez, & Fernandez 2009, 15).

In contrast, there is a high demand for distributing responsibility, cross functional knowledge and initiative in support of adaptation. Agile project management has become a rapidly adapted methodology in the IT industry and other industries have also been adapting it in the last few decades because of the uniqueness of the practices involved in agile methodologies (Papadopoulos 2015, 458). Agile project management is based on an interactive and adaptive approach where continuous feedback is received from the customer and adaptations are made in next sprint. The aim of agile scrum methodology is to deliver the executable or valuable product to the customer in an incremental delivery. Agile projects discover the complete project requirements by completing projects in iterations and therefore reducing or eliminating the uncertainty. Therefore, agile projects have a much higher element of risk than traditional projects. Agile project managers mainly focus on deliverable outcomes and business value to the customer. Furthermore, agile project management is recognized for keeping customer satisfaction and expectations with high-quality delivery (Fernandez, & Fernandez 2009, 15).

However, there are challenges with agile project management in running projects in distributed locations as the requirements are well documented and subject to change during the project life cycle. Therefore, many companies have lately tried to find hybrid project management methodology that would adapt the processes so that they would suit for their company culture and environment.

2.1.2 Managing Challenges in Global or Distributed Projects

The IT marketplace has become more global and organizations prefer to gain competitive advantage while extracting and redeploying the knowledge and resources

to other locations within their global production environment (Aarseth, Rolstadas, & Andersen 2013, 103). However, there are several known challenges to manage the global traditional projects as already discussed in earlier literatures like, managing the external contextual dimensions are challenging in global projects, e.g. managing different cultures, the lack of standard approach to the training of people working in multi-cultural environments, managing the external environment (the political, social and economic arenas) and global leadership (ibid., 106) shown in Figure 3 below.
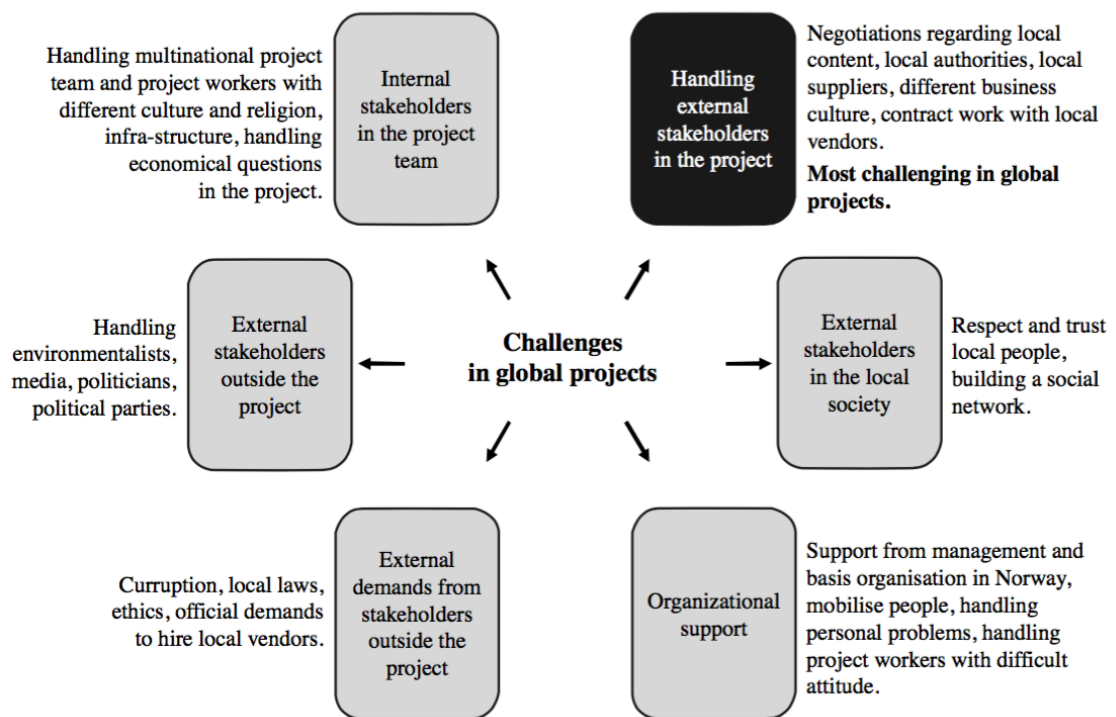
Figure 3. Challenges in global projects

(Aarseth, Rolstadas, & Andersen 2013, 118)

- **Cultural challenges:** Communication barriers, misunderstanding, different values, lack of codified approach to the training of people.
- **Global leadership challenges:** Managing different cultures, managing multiple project teams on different time zones, exchanging knowledge is difficult due to different culture.
- **Global stakeholder challenges:** Government intervention in, or regulation of, business, intervention by the parliament, shifts in institutional frameworks, political and economic discontinuities.

In contrast, agile project management is a well proven for small, collocated teams with high agility and synergy in project management. Recently few researches have shown that agile methodologies perform better than traditional methodologies also in large, distributed projects. Many improvements were observed on the quality, customer satisfaction and perception of the end product, even though agile methodologies accept requirement changes late in the project life cycle. At the same time, building good communication, collaboration in the global team and improved employee satisfaction metrics as an outcome of following the agile practices. Despite there are common challenges in agile project management as similar to other project management methodologies. In order to maintain and control larger & distributed projects, it requires additional management layer to enhance the policies, introduce new processes, communication improvement, checkpoints and customer & stakeholder engagement in the project. (Papadopoulos 2015, 455-456.)

2.1.3 Quality Concepts in Agile Project Management

In past decades, the emphasis in project planning and scheduling was managing the relationship between time and cost, with an assumption of a fixed level of quality that is seldom explicitly examined. The number of defects indicate that quality is not being emphasized in the project. Due to quality issues, a lot of wastes in the form of rework, added the complexity and probably design failure if the bug fixes are hammered in the current design. The aim of the lean-agile principle is to eliminate the waste by building quality in each milestone of the project management.

The purpose of quality management is to first understand the expectations of the client in terms of quality, and then put a proactive plan & process in place to meet or exceed those expectations. The project quality management framework has four critical quality processes as shown in Figure 4.

Figure 4. Project quality management processes
(Aims Grow Your Career official website)

Quality planning - the project manager defines and codifies the standards & policies the successful project requires and how those standards will be achieved and confirmed. Project managers must consider quality planning in conjunction with the rest of the project planning because it influences costs, scheduling and other factors. Without strong quality planning, a project carries an increased risk that the client would not be satisfied with the results.

Quality assurance is all the planned and systematic activities implemented within the quality system to provide confidence that the project will satisfy the relevant quality standards.

Quality control involves monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory results.

Continuous improvement is all about improving the processes and performing actions continuously. The continual improvement follows a plan → do → act → check life cycle (Deming, 1993).

2.1.4 Earned Values in Project Management

Earned value analysis (EVA) is one of the comprehensive tool in project management for project monitoring. Earned value management (EVM) provides certain methods for predicting the final cost of projects thus it is useful for traditional projects as it is easy to calculate whole project time frame better than agile project management. EVM has been developed and promoted within the project management community as the singular methodology for project performance measurement, particularly for cost control. In the USA, a major organization has invested significant effort in creating a national standard for EVM (NDIA, 1998), and the dominant PMI in 2005 has created an EVM practice standard. Both of these documents end to reinforce the notion that there is only one acceptable way to measure project performance, and that way is EVM. Also earned schedule as an interesting variant for improving on project progress measurement (Tomasetti, Cohe, & Buchholz 2005, 2). Figure 5 show monitoring planned value, earned value and actual cost calculated by EVM.
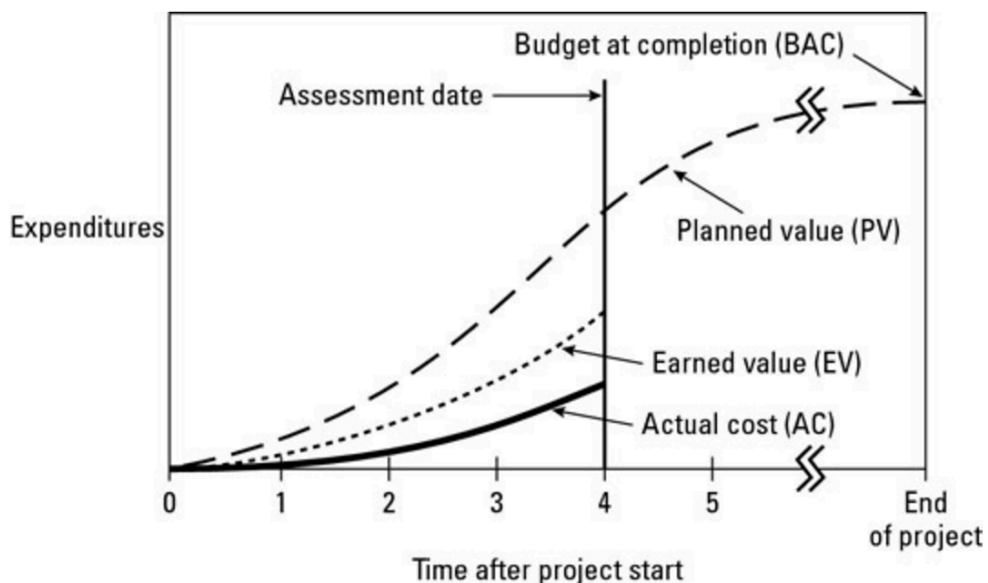
Figure 5. Monitoring planned value, earned value and actual cost by EVM (Tomasetti, Cohe, & Buchholz 2005, 2)

- **Planned value (PV):** The approved budget for the work scheduled to be completed by a specified date; also referred to as the *budgeted cost of work*

scheduled (BCWS). The total PV of a task is equal to the task's *budget at completion* (BAC) — the total amount budgeted for the task.

- **Earned value (EV):** The approved budget for the work actually completed by the specified date; also referred to as the *budgeted cost of work performed* (BCWP).

- **Actual cost (AC):** The costs actually incurred for the work completed by the specified date; also referred to as the *actual cost of work performed*(ACWP).

- **Schedule Variance (SV)** = Earned value (EV) – Planned value (PV)

- **Cost variance (CV)** = Earned value (EV) – Actual cost (AC)

- **Schedule performance index (SPI)** = Earned value (EV) / Planned value (PV)

- **Cost performance index (CPI)** = Earned value (EV) / Actual cost (AC)

Monitoring the project performance involves determining whether your project is on schedule, ahead of or behind the schedule and up-to budget. Comparing project actual expenditure with planned budget can't tell deviation that's why EVM comes in to deal with more information.

Burndown chart is one of the principle in agile project management for tracking technique as shown in Figure 6. It provides similar status and progress information what earned value attempt to measure. The burndown chart also takes care of iterative approach time gap (Cabri, & Griffiths 2006, 3-6).
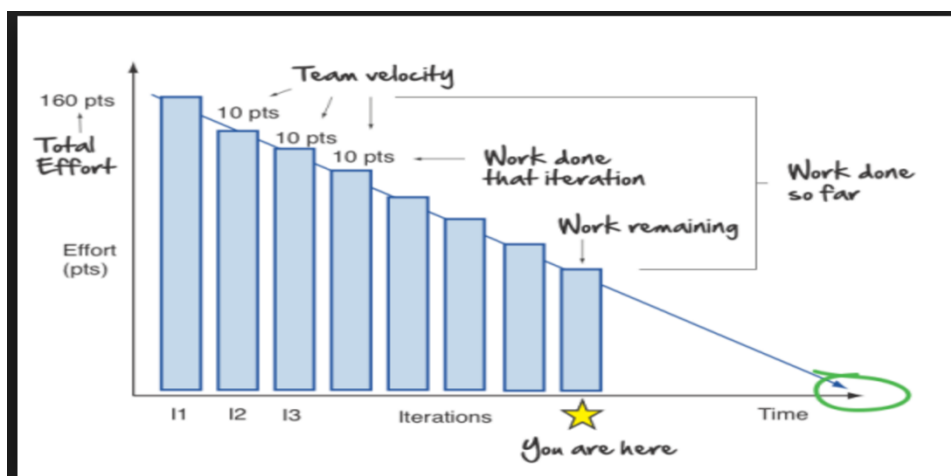
Figure 6. Burndown charts in agile project management
(Cabri, & Griffiths 2006, 3)

The implementation of Agile earned value management (AEVM) is based on traditional EVM tool. AEVM takes an input as agile scrum methodology artifacts i.e.: product backlog, sprint backlog etc., uses traditional EVM calculations and which is expressed in metrics. Furthermore, AEVM requires a set of input parameters: an actual project cost, an estimated product backlog, a release plan that provides number of iterations in the release and planned velocity. The mentioned estimates could be in hours, story point or any numeric value.

There is a difference in burndown or AEVM that burndown charts do not provide at-a-glance project cost information but AEVM is much more capable of providing project cost, schedule and variance (Sulaiman, & Smits, 2007).

2.2   Critical Risk Management Improve Project Management

In the arena of software development projects some characteristics of uncertainty are highlighted such as constant changes in project scope or product requirements, unpredicted software complexity, human resources and technical & functional skills. However agile methodology for software project management are often considered as methods for risk mitigation. Earlier literature reviews underlined that there is a possibility of explicit methods of risk management although agile methodology already support inbuilt risk management methods (Walczak, & Kuchta 2013, 75).

The discipline of project risk management has developed over the recent decades as an important part of project management. In many IT organizations, risks are considered as a barrier in project success and probability of loss in respect to revenue or employee satisfaction (Olsson 2008, 60). The project management body of knowledge (PMBOK) in 2004 defined risk as an undetermined event, uncertain condition or periodic events that if it happens then has a positive or negative effect on project objectives. The risk can have a two-dimensional outcome, a threat as well as an opportunity. Often organizations focus on threats in a manner to get them mitigated or benefit out of it for the organization.

In this competitive marketplace and highly complex project environment there is a certain need for better understanding of how projects are related to each other, resources intellectual knowledge and resource allocation. Different processes in project management may have multiple interactions that are difficult to understand and difficult to separate without impacting other processes (Olsson 2008, 61). The

current modern and progressive perspective of risk management is to give strategic role and handle it with organizational objective, instead of traditional perspective which look at risks as an unavoidable and cost impacted (Elahi 2013, 117).

In recent decade, an evolutionary change of perspective is happening to risk management, traditional companies used to consider risks in their operations simply as an extra cost which means you have to incur the unexpected costs when you encounter a risk. However, the modern companies foresee the risks those can be managed to avoid the extra cost. Managing an organization making use of risk management, not only improve the quality of your products or services, but constantly keep improving your organization called "Continuous Improvement".

This chapter elaborate about risk management in IT projects, correlation with multiple project management and also competitive advantages for companies using risk management capabilities.

2.2.1 Common Project Risks

There are different kind of risks project manager deal during project management life cycle. Many of the risks are easy to predict in the beginning of the project but however some of them might occur during the project execution due to change in the process of the project or external influence. In this chapter author will describe the most common risks in the project management which can occur in traditional or agile project management.

1. Risks in the scope and schedule

This is most common risk in IT projects due to continuous changes in the scope during project life cycle. However, the project managers have to deal with this risk in the beginning of the project to understand the scope in more details and split into different deliverables and schedule for each delivery. Usually deliverance is tangible and measured, the requirement description of deliverance describes the characteristic of deliverable. (Heldman 2005, 95). Especially this risk can damage the quality in project delivery and incurred a higher cost to complete the project or this risk may cause delay in the project completion.

2. Risks in the expectations

This risk may occur due to lack of involvement of the customer or stakeholders in the project. This may result into bad or insufficient quality in the product or service delivered to customer. In past decades, this kind of risks have been noticed very often due to lack of knowledge in the project management area or overlooked into this issue. However, in modern project management (like agile methodology), stakeholders are involved in the beginning of the project and used to have customer feedback to iterate the changes more often. It is important to understand what customer really wants, and keep them update while at the same time manage their expectation (Holtsnider, & Jaffe 2012, 264).

3. **Risks due to organization environment and culture**

This risk is most essential for the companies dealt with multi-cultural employees and projects are executed on distributed locations. People from different nation might have different attitude, as those differences can turn into project essential risks and lead to unidentified external risks. This difference can have big impact on the project if the managers do not include them in their project planning. Figure 7 shows multi-cultural impact on risk management.
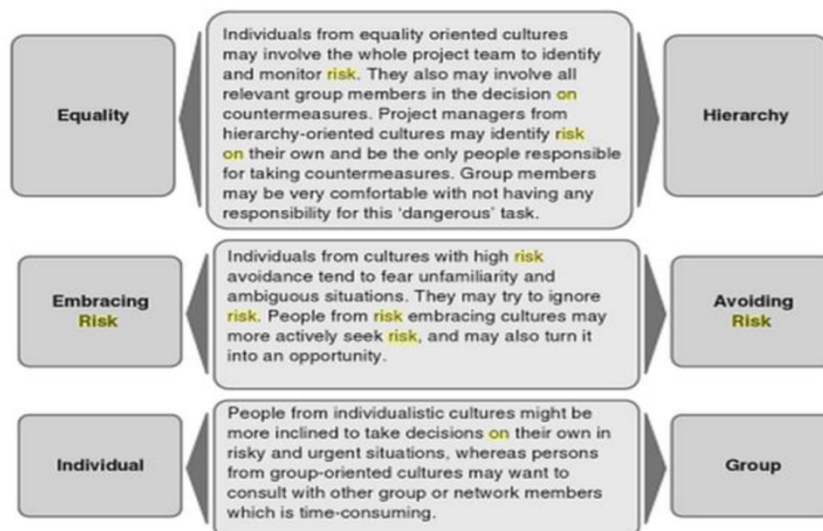
Figure 7. Cultural impact on risk management
(Köster 2010, 101)

There are many other aspects like individual's personality, organizational culture or

educational background, these aspects may cause different attitude towards risks. The proper way of managing this risk concerns different culture attitude is recognizing the presence of the risks and knowing on possible differences in the attitude towards risks.

4. Software development risks

There are several risks associated with software development and have been categorized into three main categories: Development cycle risks, Development environment risks and Programmatic risks as demonstrated in below Figure 8. Most of the IT companies often deal with these risks in Software development projects. There is always uncertainty in software development projects due to non-supportive environment, skills in specific programming language or human resources (Walczak, & Kuchta 2013, 78).
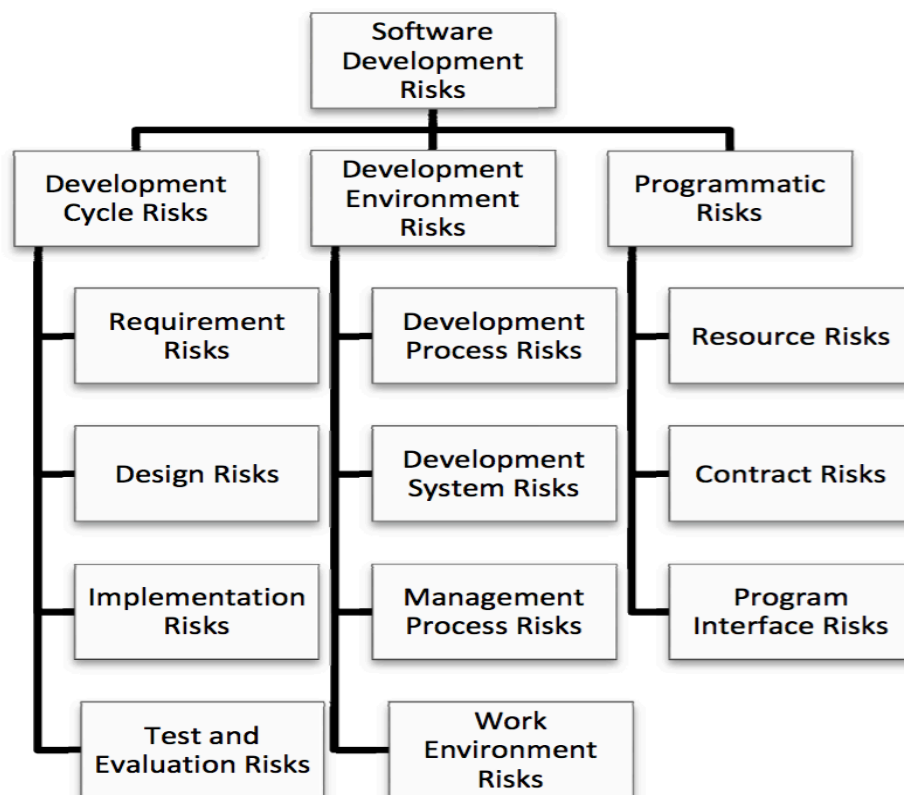
Figure 8. Software development risk breakdown structure
(Walczak, & Kuchta 2013, 78)

- **Development cycle risks:** These risks are related to requirements for a product or service which are handled during requirement analysis phase, design risk, implementation and test evaluation risks. In software development projects these are core risks and project team should be able to address them.

- **Development environment risks:** These risks are related to infrastructure and processes for software development. These risks have to be identified during project planning and setup the necessary development environments for that project as requested by testers, customers etc.

- **Programmatic risks:** These are unpredicted risks which can occur any time during project life cycle. The most common risks under this section are: resource risks, contract risks and program interface risk. In this category of risks, project manager must plan to transfer the risk or mitigate them by risk evaluation and inform stakeholder as soon as possible.

2.2.2 Risk Management

Due to globalization and increasing demand in the market, the client's requirements force company to handle risks in project management more closely. From the company perspective and overall business point of view, the success of many organizations is being increasingly dependent on the success or failure of the project. The real challenge for IT companies is to deal with risky projects (when the requirements are changing and complexity of the software is unpredicted) and improve success rate in project management (Wanderley, Menezes, Gusmao, & Lima 2015, 1002).

Risk management depends on the perception and recognition of sources of risk in project milestones. Risk management is all about understanding the internal or external risks that can affect to project management or organization objective in a bigger picture. The concept of risk management is critical and essential in project management. Often it is seen in many companies that risk management processes are not evolved or limited therefore they don't get project management maturity level. Risk management is a process of identifying, analyzing, and quantifying risks, responding to them with a risk strategy, and controlling them (Newell, & Grashina, 2004).

Business Dictionaries (2013) provide clear definition of risk management:

"The identification, analysis, assessment, control, and avoidance, minimization or elimination of unacceptable risks. An organization may use risk assumption, risk avoidance, risk retention, risk transfer, or any other strategy (or combination of strategies) in proper management of future events"

Risk management is a key responsibility of the project manager in project management to ensures that risks are evaluated and risk triggers are being monitored. While other project team members are also involved and contributed in all of the project risk management processes. The process of risk management is divided into four major categories. In addition, risk register gives better visibility to project team about risks and can be used in other projects.

1. Risk identification

Determining the risks from different sources in project milestones that might affect the project and documenting their characteristics (Wanderley et al. 2015, 1003). The purpose of risk identification process is to analysis the risks to determine which are significant or insignificant risks in the project. There are several techniques used in project management to understand and categorize the risks using, red/green light rating, risk matrix and urgency assessment.

The risk must be identified clearly and associated threats & opportunities. The impact of each risk should be well defined and understood by everyone so that effective strategies and responses can be prepared to address them. (Marchewka, 2013).

2. Risk quantification

Risk quantification is next process after identification. The risk quantification is done by qualitative approach and supported by quantitative approach (Newell & Grashina 2004, 195). In this process, the risks are evaluated and provide a solution to address them.

Most of the projects might not have enough time or cost to take action in each risk that has been identified. The aim of risk quantification is to arrange the risks according to severity, higher severity to lower severity level and it is basically a combination of risk probability and risk impact. The following quantitative techniques can be used:

- **Sensitivity analysis:** In this technique, risk factor is introduced after project plan is developed. Therefore, the project plan has to be recreated indicating risk impact. This technique is more often used for demonstration to the stakeholders of why the risk is important and needs to be addressed.

- **Failure mode effects analysis (FMEA):** This technique is being used for addressing technical or quality risks and often used in IT organizations. It is not very effective for quantifying cost or schedule related risks. However, the risk is quantified based upon safety and security issues, therefore, this technique can be beneficial for IT organizations to explain that a change in project requirements is needed.

- **Decision tree with expected monetary value:** This technique shows impact of decisions and risk events as a decision tree those were taken during the project activities and the expected monetary value quantifies those impacts.

3. Risk response

Based upon the risk analysis, some risks require a response in the project plan. Some of the risks require monitoring during the project life cycle and few risks may not require any attention. If a risk is considered high then it requires proper attention, monitoring and response in the project plan. The following are responses for negative risks as shown in Figure 9 (ibid.,195-197):

- **Avoid:** Some risks cannot be avoided thus project managers need to change the project plan so that it is impossible for the risk to occur.

- **Mitigate:** The project plan is changed to include the mitigation plan if the risk occurs. It will only have minor effect because solution to address it in place.

- **Transfer:** Risk transfer is a risk control strategy that involves contractual or legal shifting of a risk from one party to another through updating the project plan.

- **Accept:** The risk is so insignificant or unlikely to happen that does not require change in project plan.

- **Contingency plan:** This risk is often managed in IT organizations because of software uncertainty. IT companies prepare contingency "Plan B" to manage if the risk occurs. The project plan is not significantly changed, although a risk trigger is established that can be used to indicate whether the risk will occur or not and if yes then how will it impact the project.

Figure 9. Negative risk impact
(Newell, & Grashina, 2004)

The following responses for positive risks:

- **Exploit:** This type of unusual condition or risks create positive impact on the project plan to take full advantage of it.

- **Enhance:** This type of risks creates an opportunity for improvement in the project to achieve one of its objectives, thus require change in the project plan.

- **Share:** This sort of risk is often managed in IT organization to bring an outside partner onto the project that creates opportunities to improve one of the project objectives. This risk requires additional changes in the project plan.

- **Accept:** No change is required in the project plan because the opportunity is so small or so unlikely that the risk of change creates a negative risk.

- **Contingency Plan:** No significant change is required in the project plan, although a contingency plan is established that will bring into notice that an opportunity is now available to improve one or more of the project objectives.

4. **Monitoring & controlling risks**

Risk monitoring is a continuous process that a project manager does during the project life cycle. Monitoring project risks can be started as soon as the project manager has clear plan and authorized baseline (Kendrick 2009, 274). In the middle of the project some of the risks will change and some of them will no longer be possible and possibly new risks can be identified. (Newell, & Grashina 2004, 199.)

5. **Risk register**

Risk register could be a matrix, table with rows & columns or a tool that keep a track of the risks throughout the project lifecycle and the risks could be threats and opportunities as explained in above section. The risk register is not only helped project manager in risk management process, in addition to that it creates a document which contain necessary project files that can be used for further evaluation or in similar type of project risk assessment.

Risk register is structured in a simple way that each row is a risk and columns track information associated with the various risk management processes. The risk matrix can be extendable with '1 to n' number of columns depend on the requirement.

2.2.3 Manage Project Portfolio Risks

In global market, it is necessary for organizations to execute multiple projects simultaneously to achieve the organizational objectives and gain the competitive advantage (Wanderley et al. 2015, 1001). Therefore, the management of a single project does not exist often in IT companies. The scope of a single project perspective seems insufficient, and a more holistic and business oriented perspective should prevail. Therefore, risk management for a single project sometime might not be sufficient. However, managing the projects in a multi-project environment automatically refers to the management of project portfolios instead of simply the management of single projects separately. In the project oriented organizations, risk and opportunity management must be considered as organizational issue and those are associated with organization objectives (Olsson 2008, 65). At some level, current risk

management process does not support project portfolio effectively and the following issues can be seen:

- Supports no interaction between projects

- Cannot measure effectiveness (i.e. what are the benefits of risk and opportunity management, and in which project do we need to improve the performance)

The portfolio management is wider and diverse. Project management office (PMO) has to document all the ongoing and upcoming projects and project managers need to understand the relationships among each project and analyze the risks critically during the project life cycle.

1. Portfolio risk analysis

There are three steps to analyze the portfolio risks as demonstrated in Figure 10.

- **Step 1:** The project issues need to be analyzed and compared with other similar type of projects. This analysis step reveals whether there are any common issues within the portfolio and if such common issues affect parts of or the whole portfolio and any potential improvements within or outside of the portfolio that have an effect on the projects within.

- **Step 2:** The purpose is to extract the risk data from risk register for all the projects and compare the selected project issues with risk register data. The aim is to find the similar issues in other projects and how those have been tackled. This step is complicated because you have to critically analyze the risk data from risk register and level of complexity.

- **Step 3:** The last step in the analysis methodology is to compare risk data from different projects. This analysis is the most time-consuming analysis, mainly because of the large amount of data. This analysis requires a common starting point of the analysis.
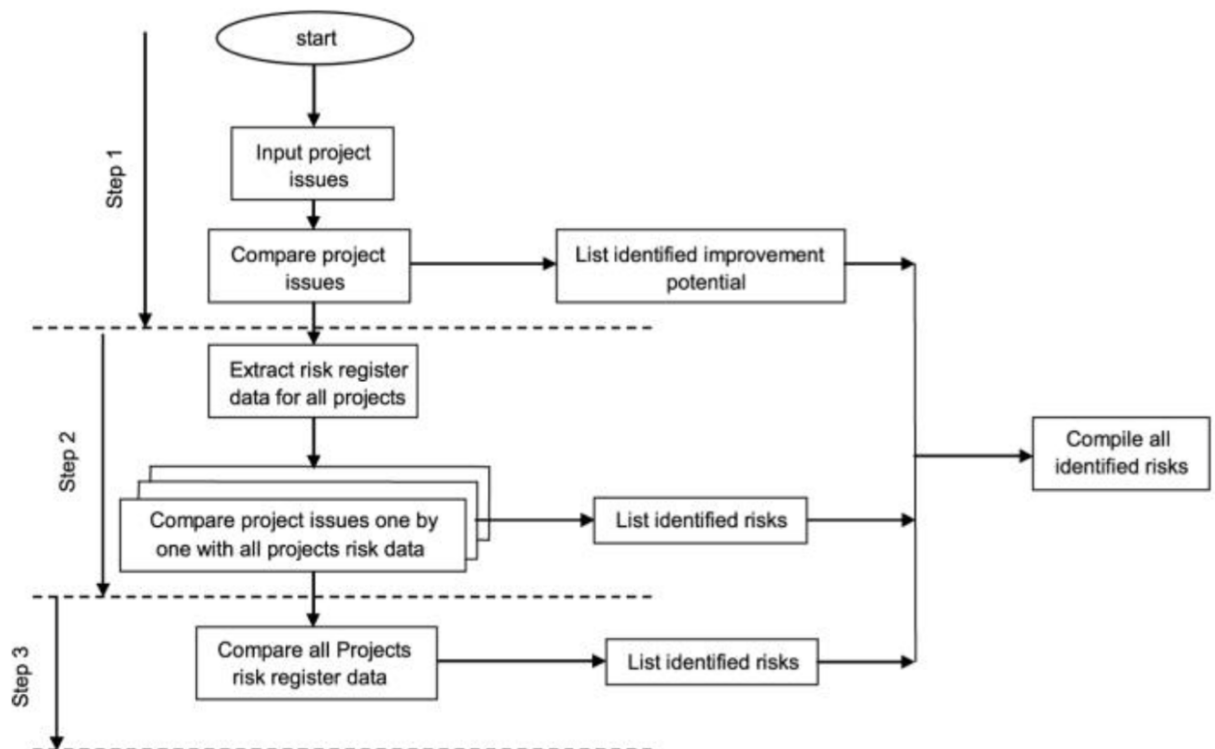
Figure 10. Portfolio risk analysis

(Olsson 2008, 67)

2. Benefits of portfolio risk analysis

There are mainly three benefits of portfolio risk analysis as described below:

- **Improvement of project risk and opportunity effectiveness:** The comparison of risks between projects allow reflection and analysis of the situation and the adoption of risk mitigations actions. It is also possible to find common focus areas and this can provide feedback and experience from other projects and their risk response actions.

- **Portfolio analysis benefits:** This level of analysis will reveal portfolio common risks and identify portfolio risk trends. Since the projects are separated with regards to degree of completion within the portfolio, a risk in one project could be avoided in others. This level will assist with the identification of focus areas for performance optimization improvement projects where opportunities could be realized.

- **Organizational benefits:** If several portfolios within a company are compared, this level of analysis will identify risks that are common within all portfolios. These risks can either be related to a portfolio or to other non-project specific activities. Examples include the procurement process, the company IT infrastructure, or the Human Resource (HR) process.

3. Leveraging risk management to gain a competitive advantage

This section describes how the risk management can be used as a source of competitive advantage. It often depends on the type of risks an organization is exposed to use risk management capabilities. There are mainly two types of risks which are deal with competitive advantage: rewarded risks and unrewarded risks.

Rewarded risks are those associated with an expected benefit. These rewarded risks are considered as hope of creating more value example developing new product or service, enter into new business or market etc. Another way, rewarded risks are direct or indirect consequence of our own decision when we seek higher reward of risky business.

Unrewarded risks are explicitly imposed by external forces with no potential value. Natural disasters, industrial accidents, theft, pandemics, etc. are all examples of unrewarded risks. As usual companies try to avoid or mitigate these risks during project planning phase (Elahi 2013, 124).

Risk management capabilities can simply relate to competitive advantage framework of Michael Porter (1985). As Porter mentioned that there are two major ways that a company can gain competitive advantage over its competitors: cost advantage and differentiation. Risk management capabilities can also affect both a company's costs and the value it creates for its customers (differentiation).

Depending on the risk category, company can turn risk management capabilities into a source of competitive advantage as demonstrated in Figure 11.

	Disruptive Risks	Non-Disruptive Risks	
Rewarded Risks	Seeking Riskier, but Potentially More Profitable, Businesses	Seeking Riskier, but Potentially More Profitable, Businesses	
		Building a Resilient Image	
Un-Rewarded Risks	Keep Serving When Others Cannot	Excelling in Management of Everyday Uncertainties	

Figure 11. Gain competitive advantages with risks

(Elahi 2013, 125)

In this competitive market, risk management deserves executive attention at a strategic or tactical level. When a company seeks risk management capabilities from a strategic point-of-view, these capabilities can be leveraged to gain competitive advantage. This can be done by either stronger in dealing with disruptive risks when it hits everyone or looking into riskier businesses with higher potential profits or creating a resilient image. Figure 12 shows risk management is a source of competitive advantages.

- Faster Pace of Change
- Increasing Complexity
- Multi-Polar Global Order
- Globalization
- Increasing Interconnected Risks

Lead to → Very High and Increasing Level of Risk & Uncertainty

Requires → Strategic-Level Attention to Risk Management

Can Create → Proper Risk Management Capabilities

Let You →
- Keep Serving When Others Cannot
- Seeking Riskier Businesses
- Excel in Everyday Performance
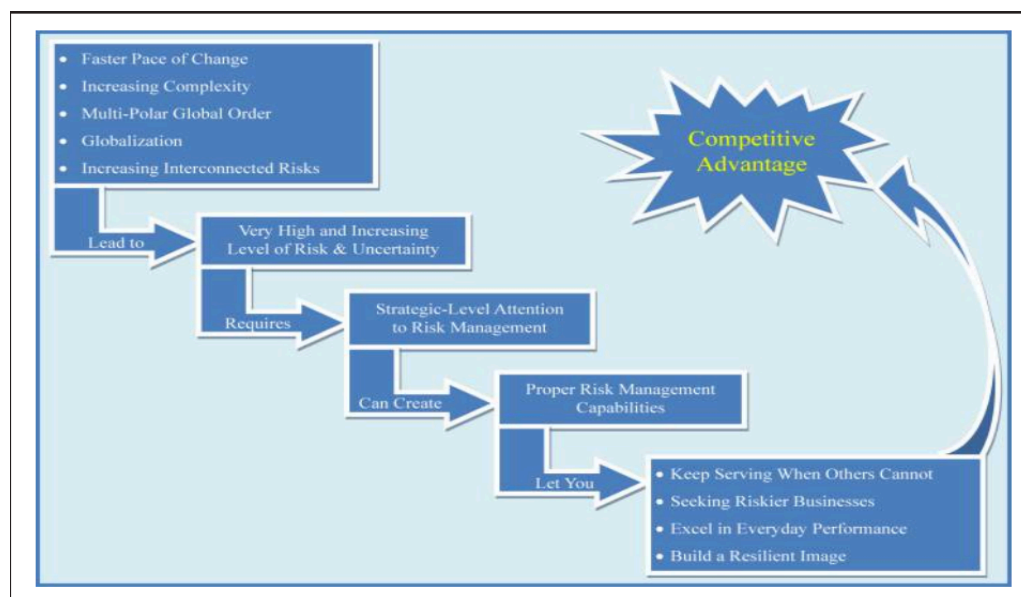- Build a Resilient Image

Competitive Advantage

Figure 12. Risk management is a source of competitive advantages

(Elahi 2013, 128)

2.3 Quality Empowerment Improve Project Management

In today's global economic competition where products and services are cross international borders with less difficulty and this trend is more visible than in past. Companies are specializing in products and services so that they can market to other countries while completely avoiding the development of less valuable products and services. The development of certain products or services are avoided so that they can be purchased at a low cost than they can be produced. To analyze the competitive nature of the product or service, it is fundamentally important to focus on the customer requirements and needs. Quality in a product or service is, the degree to which the customer's requirements and expectations are satisfied. These days, quality management is dominating or became critical factor in project management to meet the customer expectation and increase overall project performance.

This chapter elaborate about quality concepts in general, quality in-build in service and managing information flow in project management to improve the quality.

2.3.1 Quality Concepts in General

Quality has become critical factor in project management for IT companies. Customer understand quality is inclusive with product or service therefore it is becoming one of the competitive factor in global market. The bad quality product or service become word of mouth in social media which may cause big penalty to organizations. However, some organizations get competitive advantage with good quality product or service.

Quality concept can be defined in several ways and from different points of view. It can be summarized as meeting the customer needs in an efficient and profitable way as possible. Service based IT companies try to provide consistent and stable services to their customers on competitive prices. Companies make all possible quality checks to meet customer expectations. On the other hand, customer may be very satisfied with the service but if the process to provide service is too expensive then it will undermine the company profitability. Seeking higher quality will thus lead to non-profitable organization. (Lecklin 2002, 18-19.)

Agile project management provides certain checklists and in-build processes which often improve quality in project management. However agile enforce on small team structure and maximum customer involvement so that customer needs are clearly determined in the early phase and feedback is collected in each milestone of the project. Agile project management best practices also recommend quality document which can be automatically generated by system or less involvement by team. Therefore, quality is highly connected with continuous improvement in the processes. (ibid., 20).

1. **Cost of quality**

The cost of quality is high in IT industry as most of the projects get delayed due to quality issues in the software. Also, fact is that uncertainty involved in the software development life cycle because of dependency to knowledge, skills in the specific technology. It is difficult to demonstrate the exact cost of the quality but cost can be shown as a target level of the quality and the cost to achieve that level.

However, the service based IT companies try to build optimal level of quality control so that it would not increase the cost for the company and customer should not be compromised with the quality level. In this model, the cost of the quality control is presented as the prevention cost curve and the cost of defects is shown as failure cost curve. The sum of these two cost elements is shown as the total cost curve. It can be used as the total cost including quality costs and cost of non-conforming products. At the lowest point of total cost curve is optimal situation when failures and quality assurance are in the balance as shown in Figure 13.
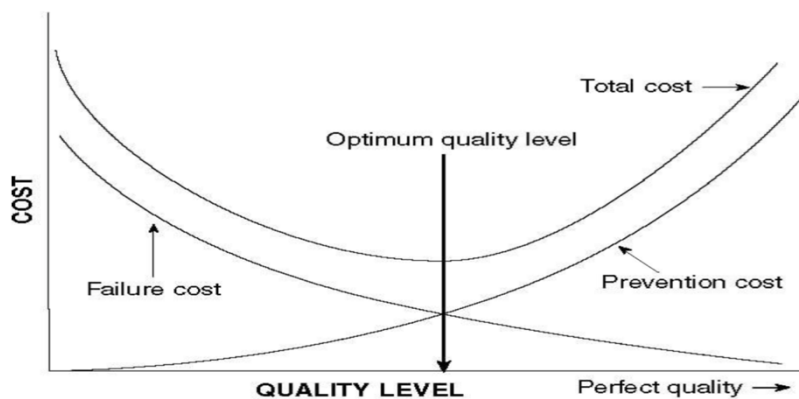
Figure 13. Classical model of optimum quality costs
(Juran, 1988)

2. Cost of quality defects

The cost of quality is different in each phase of the software development projects. A 20:80 model is very famous in IT industry that project spends 20 percent of total cost to develop a happy path and 80 percent is spent on special scenarios to cover. The cost of quality also works similarly if you spend good amount of time in requirement analysis and designing then less time you have to spend in development and only limited re-work need to be done. On the other hand, the cost of preventing defects is higher when the targeted quality level increases. Perhaps it is because of thorough testing planning and expensive tools used for quality assurance. Gradually it will reduce the number of defects and minimize the cost of failure which is incur for fixing the defects. The main principle is that early findings save cost and time.

In the worst case, the error is found in the operation and reason for error is a mistake in product requirements. Then fixing the error means that all phases have to be repeated before fixed product can be deployed to the field operation as shown in Figure 14. (Pressman 2001, 198.)
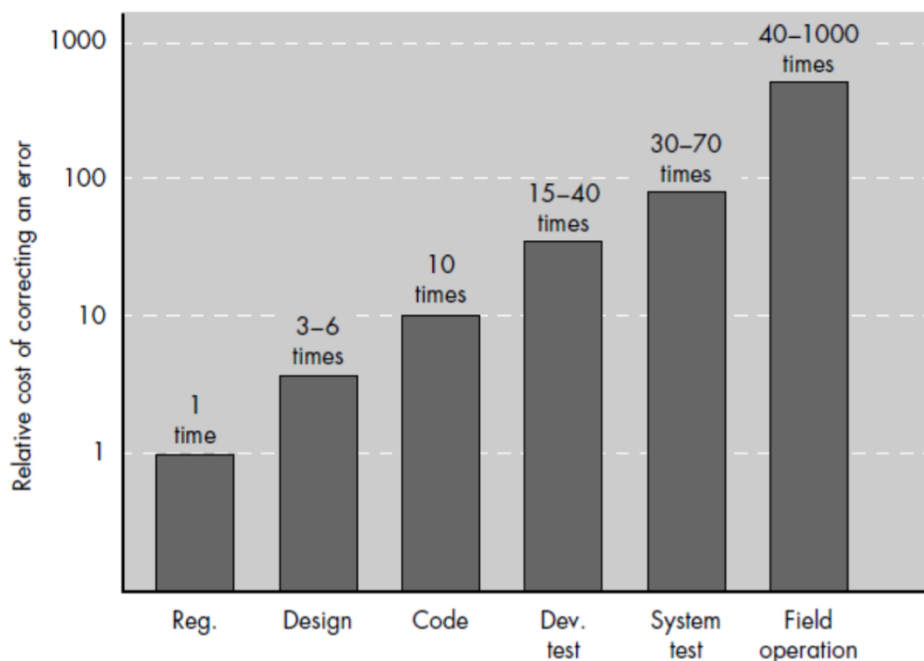
Figure 14. Relative cost of correcting an error
(Pressman 2001, 198)

This model has been divided into six phases:

- Requirements: Definition of product requirement before actual implementation.
- Design: Detailed specification of product.
- Coding: Actual implementation of specified product.
- Development testing: Testing of single blocks.
- System testing: Testing product as part of larger environment.
- Operation: Customer uses product in actual application.

2.3.2 Project Quality Activities

In last, few decades the presence of small group projects in the organizations has been increasing. The logical reason for this growth is due to perceived increased performance with projects as compared to non-project environments. There is definitely higher rate of return in project based organization than comparing to some sort of manufacturing of product based companies.

However lately many organizations revealed that they are declining the rate of return due to globalization and competitiveness in the marketplace. Because of high demand from customers and schedule pressure is causing deep quality issues in the project and project performance. To overcome this issue, every project managers and firms want to include quality management (QM) or project quality activities (PQA) in the project environment. Many big organizations adopted TQM (Total quality management) and entire organization operate in terms of better assessing the quality requirements of a product, integrating quality into products and evaluating the product for quality requirements and customer satisfaction. TQM not only recognized in execution but also in implementation. (Masters, & Frazier 2007, 26-27.)

On the other hand, PQA is mainly adapted by SME companies to improve the overall project performance. PQAs are defined as process improvement activities within a defined project that maximize conformance to requirements while minimizing project capital. PQAs are mostly recognized as increased project performance.

Table 1. Summary of quality activities in PQA and TQM
(Masters, & Frazier 2007, 28)

Knowledge Area	TQM factors	PQA
Integration	Open Organization	Interdependency management process
Time	N/A	Time-related processes
Scope	Closure customers relations	Scope-related processes
Human resources	Employee empowerment increased training	Personnel-related processes
Cost	Zero defect mindset	Cost-related processes
quality	Measurement process improvement	quality activities
Risk	N/A	Risk-related processes
Communication	Adoption and communication	Communication related processes

TQM and PQA both are involved with quality activities and planning the scope of the endeavor, not just one portion. TQM involves rethinking the role of the employee, relationships to customers and suppliers, having top management commitment and viewing quality as a way of doing business, not just limited activities performed by one department. On the other hand, PQAs are also involved with the entire scope of the project, require the support from management, focus on maximizing resources and communication through minimizing the waste. Only difference is that TQM is an ongoing and require a long-term commitment but PQA is limited to the life of the project but it has to be adapted in project environment. (ibid., 29-30.)

The following propositions were identified related to PQA:

1. Project performance is increased when there is an increased project quality goal related activity.
2. The relationship of PQAs and project performance is moderated by goal feedback.

3. Project performance can be increased by increasing individual goal setting activities.
4. The stronger the individual goal setting is identified within the project, more the individual project members will contribute to the PQAs.
5. Individual goal setting will define the strength of the relationship between PQAs and project performance.

It is proposed that there will be a significant, positive relationship among independent variable (IV) PQAs and dependent variable (DV) project performance. The greater the level of PQA present in the project management, the more project activity will support useful work endeavors, with minimal waste activities as shown in Figure 15.
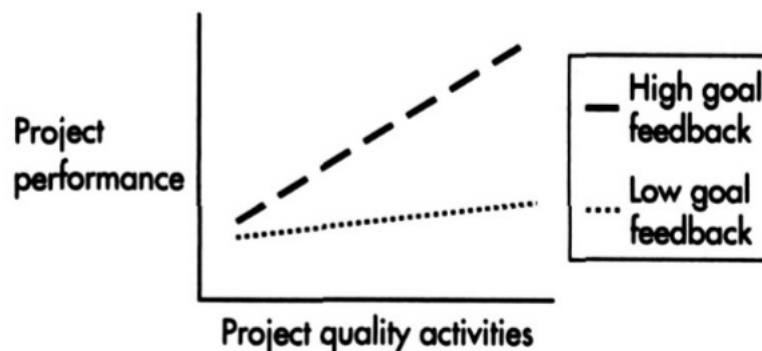
Figure 15. PQA vs. project performance in high/low goal feedback
(Masters, & Frazier 2007, 32)

The effectiveness of the PQAs to increase project performance is highly dependent on individual goal settings and ownership of the PQA. Otherwise project members lose their interest and become performance-reducing activities. Individual goals should align and complement strong project performance.

2.3.3 Service Quality through Project Management

In this global marketplace customer is able to get high quality services on low rate. This enforces organizations to evaluate the processes to produce high quality services on economical prices to compete in the market. However, the customer is more demandable and prefer to customize the service with their own life style and that is

causing trouble for organizations to rethink and understand the customer behavior and their needs.

To be able to understand and define quality in services, it is important to first study the characteristics of a service, because the service characteristics differ in many ways from a plain product that customer purchase. A service is a process that consisting of an activity or a set of activities (Grönroos 2007, 52).

For a service based IT company it is important to understand the customer needs and expectations. To make the operationally effective and efficient service, organization needs to deeper look into service characteristics and behavior. The effective IT project management processes help to improve the service quality and deliver on time. However, most of the services are characteristically intangible; there is little or no physical evidence on produced services. Therefore, it may be difficult to explain and assess all the aspects of the service.

1. **Quality model and dimensions of a service**

A dimension is an important factor for the service quality that plays an important role when a customer is evaluating a service provider or a process. Dividing the complete service process to a few dimensions makes it easier to evaluate the pieces and finding the weak spot. There are diverse approaches to the subject, the variations depending on the different authors and inventors of the models. Understanding how the services are evaluated, enables organizations to influence these evaluations and push them in the desired direction (ibid., 71). The customer experience on service quality is described into two dimensions, the technical quality – what and the functional quality – how as demonstrated in Figure 16.
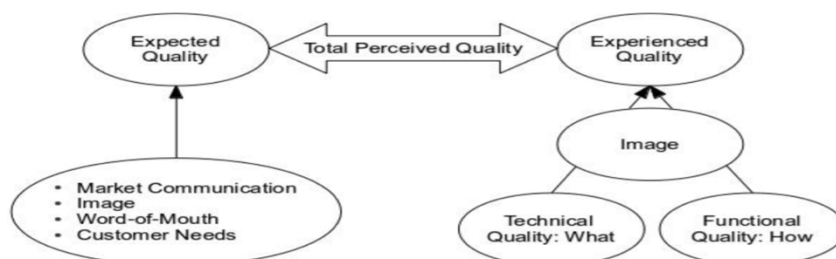
Figure 16. Service quality model

(Grönroos 2007, 77)

The technical quality corresponds the outcome of the provided service example, agreed speed of the broadband internet. The functional quality corresponds the way of the delivery of the outcome.

2. Service quality gaps theory

The service quality is the measure of the gap between customer expectation and experience of the actual delivered service. According to Parasuraman et al. (1985) and Zeithaml et al. (1988) there could be four different types of gaps in the overall service process. The Figure 17 demonstrate the different gaps in the service process.
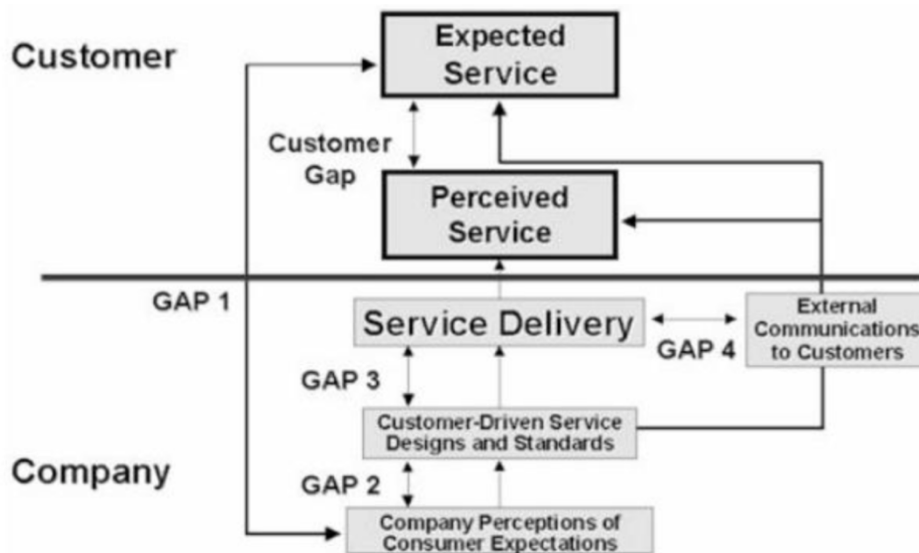
Figure 17. Gap model of service quality
(Parasuraman et al., 1985)

- The first gap happens between consumer expectations and company perception of consumer expectation. This is happened when company does not know what customer wants due to lack of market study and customer needs.

- The second gap occurs partially as a result of first gap, the design and standards are not aligned with customer expectations as company did not collect the enough requirements.

- The third gap takes place in the actual service process, between service quality specifications and actual service delivery. This gap occurs because of variations in the performance of employees, who are either not able or not willing to act upon the desired level.

- The fourth gap relates also to the actual service process being compared to the external communications about the service. This is relevant, since it describes how the actual service differs from the market process. The advertisements and promotions of the company should not promise more than can be delivered, nor present inadequate information.

3. Measuring service quality

Measuring a service quality is really challenging before having an actual experience with it. However, it has to be critically assessed and their service characteristics and the fact that the perceived quality happens as a rule in the mind of the customer, and different customers have diverse starting points.

Lately some tools were developed and have been tested in many service based companies to measure or critically analyze the service quality. Most of the measurement tools are often used two mechanisms: Quantitative or Qualitative. In quantitative tools the service quality is investigated based on mathematical, statistical or computational techniques. In qualitative tools the service quality is investigated based on interviews, discussions and observations. Talking and listening to the customer is always the principal method in order to understand their real needs, expectations and experiences, therefore direct contact should be preferred. This is even more important if a failure has happened and the customer needs to be compensated and satisfied. (Grönroos 2007, 125.)

These days many service based organizations designed a questionnaire to get customer experience or feedback for delivered services and quality level. Mainly questionnaire consists of ten to fifteen questions about service quality, processes, delivery, suggestions or improvement ideas and customer has to rate them from one to five grades. Based on that feedback, service based companies compare and critically analyze the results and make a plan for continuous improvement in the service. Parasuraman et al. (1988) designed a questionnaire to measure service quality, the SERVQUAL, which measures and compares the customers' expectations and

perceptions of the delivered service. Later on, another model was created, SERVPERF (Cronin, &Taylor, 1992) which was similar, but uses approach to measure customers experience only.

2.3.4 Managing Information Flow in Project Quality Management

Information system plays a vital role in improving the quality in project management. As project managers collects the information from different sources: internal & external and extract most relevant information for the project team & stakeholder and keep them stored during project life cycle. However, the information flow is not well defined in many organizations due to lack of knowledge or control on the information, then impacted by quality in the project management.

In last few decades, enterprise companies conform the quality in product and services and obtained certifications of ISO 9000 quality systems. Many companies revealed that effective implementation of ISO 9000 quality standards can benefit the certified organizations through the improvement of management control, efficiency, productivity, and customer services (Zeng, Lou, & Tam 2007, 30).

This section briefly explains the information requirements, flows and possible barriers in information flow which cause quality issues in project management.

1. Information requirements and flows

There are number of definitions of information however information could be defined as some data selected for a specific purpose. The purpose of information management is that anyone can easily access and if needed it can be transform. The relevant information is critical for any industry and as well as to improve the quality of the project management. It has been stated that quality information management is concerned with effective communication and covers its acquisition, generation, preparation, organization and dissemination, evaluation and management of information resources. (ibid., 32.)
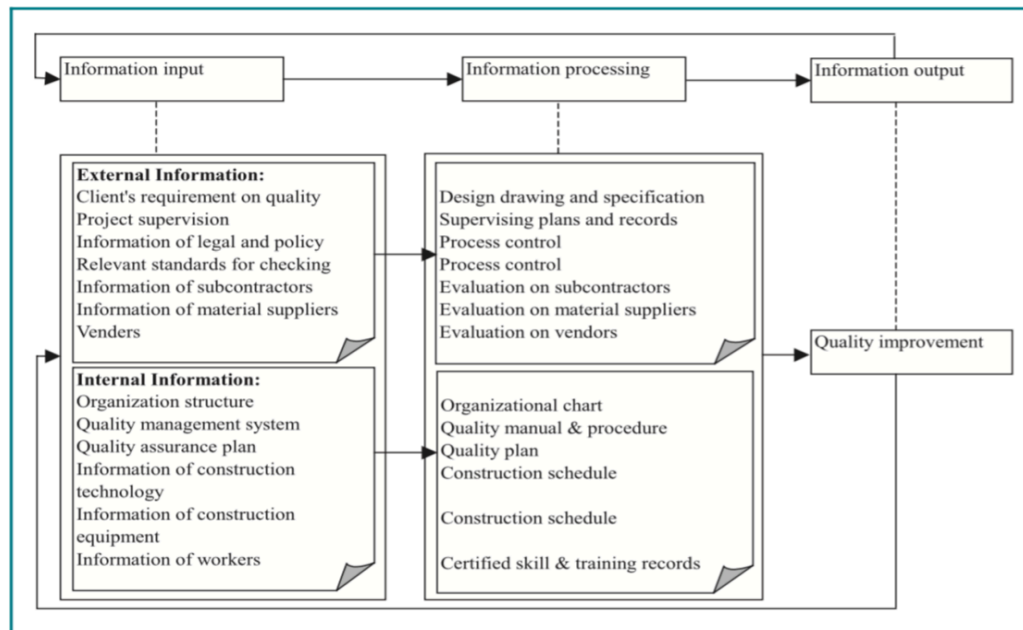
Figure 18. Information flow chart
(Zeng, Lou, & Tam 2007, 32)

The information collected from different sources must be analyzed, processed critically and utilized effectively to improve the overall quality management (ibid., 34). However, the uncertainty and equivocality of information result in the complexity of research on information flows.

The Figure 18 is shown above explain that how the information flow works and how the information is collected from external & internal sources and should be processed critically to eliminate the unnecessary or misleading information otherwise it might cause serious issues in the information interpretation.

2. Barriers in information flow

It is extremely important to examine information barrier in business processes and project management for managing the information flow in quality management. There could be three types of barriers in information flows in quality management as depicted in Figure 19.

- Organizational barriers: These are barriers due to the organizational structure of the firms involved in a global IT project; include multi-level structure barriers and horizontal communication barriers.

- Behavioral barriers: These are barriers mainly due to behavioral characteristics of related persons, culture and posts; include un-compulsory liability and lack of incentive mechanism.

- Technical barriers: These are barriers mainly due to the technical characteristics of information in IT projects. Lack of information collaborative system and application in different projects are two main aspects.
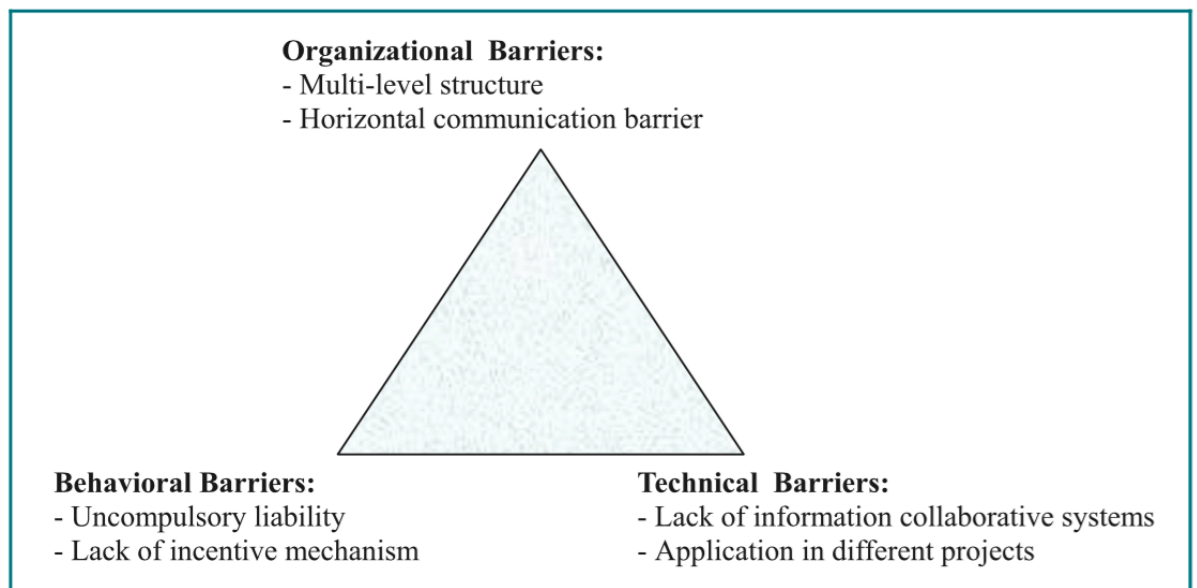
Figure 19. Information barriers in information flow
(Zeng, Lou, & Tam 2007, 36)

Many IT companies are facing serious challenges with information barriers in information flow. However, lately many companies have revealed that properly managed information flow in the organization have achieved competitive edge in the marketplace and able to advance the relationship with customers with good quality of products and services.

2.4   Monitoring and Control Improve Project Management Success Rate

Project monitoring is one of the key activity in project management and its main responsibility to provide necessary information for proper control on the project plan. Project monitoring covers different possible issues related to schedule, cost, resources,

risks and quality as well. Monitoring & control (M&C) processes provide set of methods, techniques and tools to monitor the project plan. For example, EVM method is often used to measure the multidimensional systems and M&C (Montes-Guerra, Gimena, Pérez-Ezcurdia, & Díez-Silva 2013, 164). There have been some improvements in EVM lately to forecast the final cost and duration of the project by analyzing the performance of the calendar (Earned Schedule).

Perhaps there could be two approaches to improve the project management performance. The prescriptive approach focuses on the formal qualities of the project organization including documentation, processes and procedures. The adaptive approach focuses on the processes of developing and improving a project organization, project culture and team commitment (Rolstadås, Tommelein, Schiefloe, & Ballard 2014, 638).
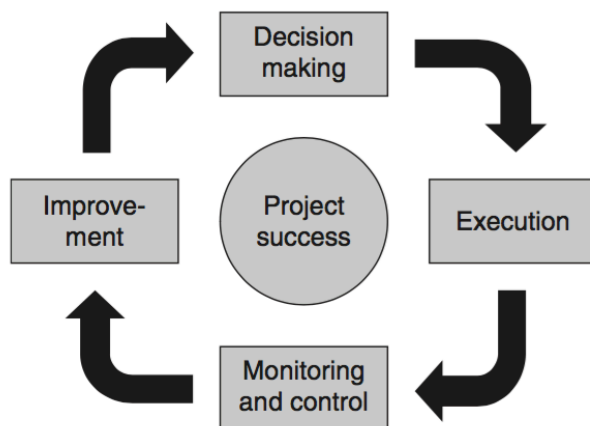
Figure 20. Organization processes in project execution
(Rolstadås et al. 2014, 643)

The project success rate gets improve time-to-time when project management processes are aligned with Plan-Do-Act-Check life cycle of lean principle. Of course, it is important to take into account the dynamic situations and complex external impact or influence on the organization processes.

Moreover, many researchers have proposed a multidimensional system to quantify the deviation from the planning to implementation phase, which includes aspects such as quality, which is difficult to analyze by the traditional techniques. Recently another

technique is transferred from the area of management to organization to enhance the M&C project, is the balanced scorecard (BSC). Its main function is to detect changes in the market to give rise to organizational changes and it has four main perspectives: customer, internal processes, learning and growth (Montes-Guerra et al. 2013, 165). BSC is appreciated in many organizations and industries for improving the effectiveness of project management and improving operational performance of the project teams.

The pentagon model (shown in Figure 21) was proposed in earlier studies also for analyzing the performance of the project organization and project management approaches. The Pentagon model takes both formal and informal aspects into account and analyze five different aspects:

- Structure
- Technologies
- Culture
- Interaction
- social relations and networks
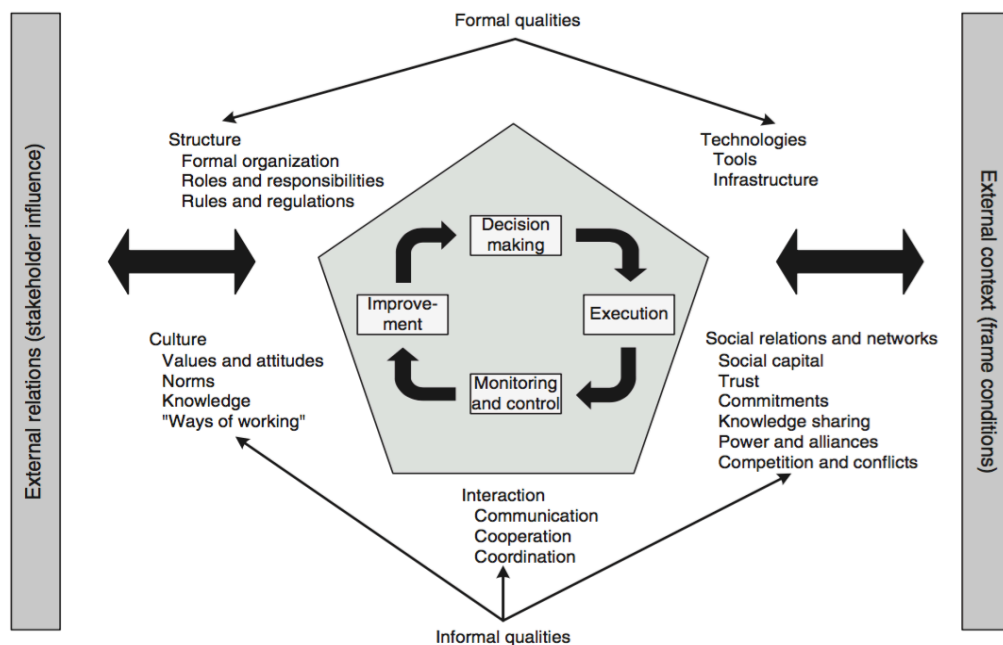
Figure 21. Pentagon model
(Rolstadås et al. 2014, 644)

The five aspects of the pentagon model can be applied to analyze factors which influence the performance of the project organization as they cover both formal and informal internal qualities in a systematic way and the organization is also exposed to external aspects. The external context frame conditions those are characteristics of a project that can't be changed by project management like: geographical team location, culture, different time zone (ibid., 644).

Many researchers have emphasized lately that it is impossible to generate a universal list of quality criteria because it varies from one project to another. New dimensions are adopted to enhance M&C in the project such as management process quality and meeting stakeholder expectations. M&C is a project management process commonly referred by all the body of knowledge, it represents important processes within their standards.

2.5   Theoretical Framework

On the basis of literature reviewed in above sections, it can be concluded that project quality activities improve overall project performance and schedule. IT companies are heavily emphasizing to improve the project management processes to gain the competitive advantages in global market. On the other hand, many IT companies already have proven project quality management processes in-place and knowledge, based on that they are dominating in global market to acquire big IT projects.

However, the majority of IT companies are still struggling with maintaining the good quality level in product or services and keeping project schedule in mind. The companies are trying to find a suitable project management methodology and framework which would not increase the operational cost and should be effective & efficient. Therefore, the companies are approaching hybrid project management methodology and processes to deliver the project on schedule with decent quality level agreed with customers.

The Figure 22 represents the theoretical framework for the research in project quality management. This framework gives basic understanding of different processes involved in project management and quality activities to ensure that project will be delivered on estimated cost and time with agreed quality level.
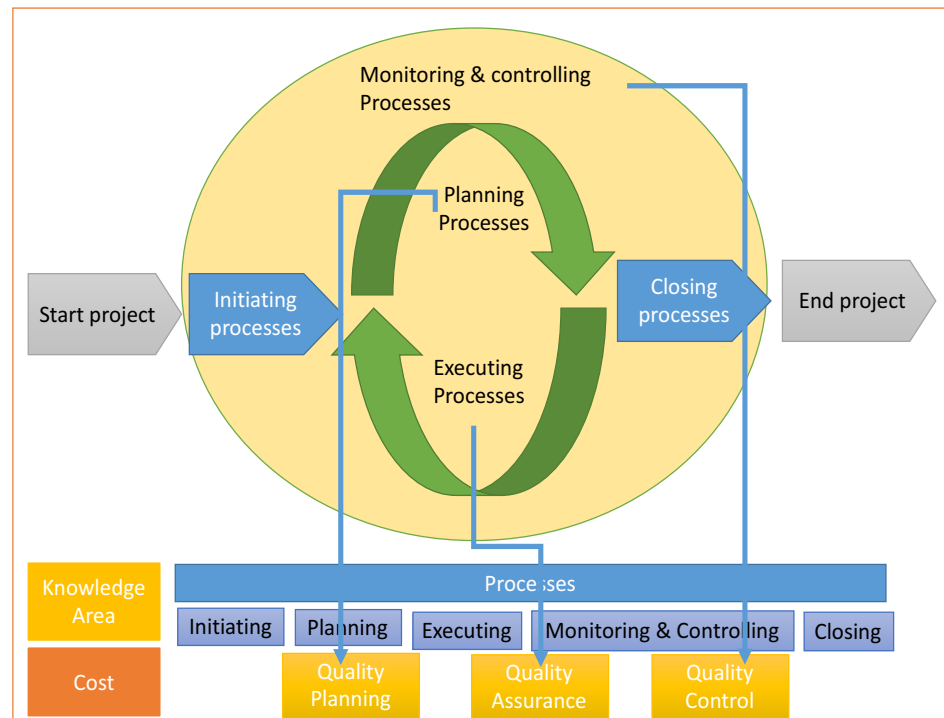
Figure 22. Theoretical framework for the research

3 METHODOLOGY

The purpose of the study was to determine different aspects of the quality activities in project management. The earlier reviewed literatures revealed that IT companies are struggling with quality issues in their project management processes and practices. One of the main causes of this is that companies want a faster time-to-market due to high business agility.

This chapter explains the researcher research approach and how the empirical data was collected as well as justifies why it was chosen. The research process is involved several cycles in a systematically manner in which the researcher developed the idea, supported by previous literature reviews and validated by empirical data collected from different sources.

3.1   Research Approach

A qualitative research approach was chosen for the research. Qualitative research provides insights of the research topic that are difficult to produce with a quantitative approach. According to Golafshani (2003, 597), qualitative research uses a naturalistic approach that seeks to understand phenomena in a context-specific area where the researcher does not attempt to manipulate the phenomenon of interests. Furthermore, the research is more interested in people's belief, experience and understanding systems from the perspective of subject matter experts. The methods are used mainly subjectively in qualitative research and they do not include statistical analysis and empirical calculation (Brink 1993, 35).

A qualitative study is about techniques and procedures for developing grounded theory through "listening to context-specific data" and gaining a deeper understanding of it (Strauss & Corbin, 1998). Qualitative research is defined to be more purposeful for any kind of research that produces findings, inside knowledge in that area. However, this kind of knowledge cannot be gained by means of statistical procedures or other means of quantification (Golafshani 2003, 600).

Qualitative research involves the "researcher as an instrument", wherein the researcher plays a vital role in data collection (Law, Stewart, Letts, Pollock, Bosch, & Westmorland, 1998). It was the researcher's own personal interest and considering career aspirations in Project Quality Management that were in a key role in the data collection and the effort to enrich understanding of the research phenomenon within a context. According to the nature of the research context, it was difficult to justify the results in a statistical manner. Therefore, the qualitative research approach was the desired choice. The quality concerns in project management had to be thoroughly understood and addressed by using the qualitative research approach.

The research strategy was selected to be a case study for which expert interviews in the area of project quality management were conducted in the case company. The researcher was a member of PMO in the case company - operations account, which was why he had direct access to the project management related documentation and processes that the case company was using. The researcher familiarized himself with the documentation and processes followed by the case company as a first-hand information. Furthermore, the researcher planned to conduct expert interviews based

on the preliminary information collected from the case company documentation in order to understand the criticality of the topic and collect inside information.

Figure 23 below demonstrates the research strategy in a systematically manner (Saunders, Lewis and Thornhill 2009, 600).
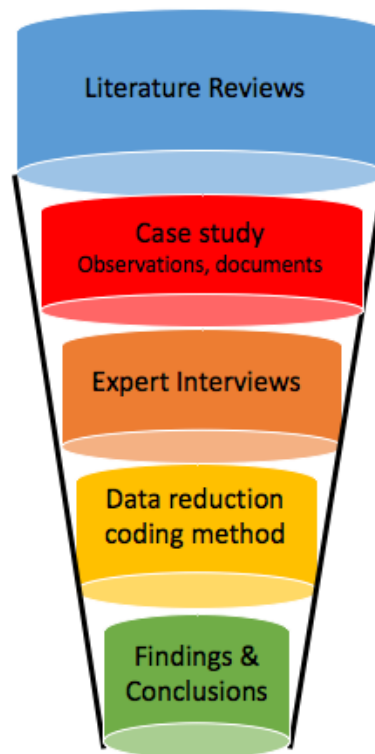
Figure 23. The research strategy

3.2 Research Context

IT Industry

The IT marketplace has become challenging, more global and service-oriented. Most of its products or services have become international and easily available at affordable prices. The companies aim at the best customer experience, but it is too difficult to keep customers satisfied as they seem to be more demanding because of being used to experiences provided by well-known consumer brands, such as Apple and MailChimp.

The competitive economic condition is a driving force, and for this reason, many IT organizations have found it is increasingly difficulty to compete in the market. To survive in the current business environment, it is necessary for organizations to look for different ways to improve quality and efficiency in the IT project management in order to enhance their competitive edge. (Zeng, Lou, & Tam 2007, 30.)

Finland

Finland has always been good in the IT and telecommunications market. The big network operator was Post, Telephone and Telegraph (PTT) company. In 1969, there was a formal and informal conference between the Nordic PTTs, Denmark, Finland, Norway and Sweden, which initiated a project to develop an automatic Nordic Mobile Telephone (NMT) network. The NMT business was a fast-growing market in the world and it introduced many new entertainment and telecommunication features. By 1985, NMT held a number of positions in the foreign market and had an above 50% annual growth rate. Afterwards, several Nordic mobile manufacturers and network infrastructures entered into the market (Porter & Solvell, 2011).

In 1979, Nokia and Salora created a joint venture under NMT, and the purpose of this joint venture was to develop radio technology and especially new NMT phones. After that, Nokia started expanding its international operations by acquiring several electronics companies and establishing manufacturing plants in new emerging economies (such as China and India). After NMT network establishment, the Nordic region was recognized as having the world no. 1st ranking in the telecommunication industry.

Until 2008, Finland was the market leader in the Information Communications Technology (ICT) cluster, but after Nokia's downfall, Finland lost this position (ibid, 2011). However, Finland is still counted as a technologist nation with highly skilled ICT workers. According to the WEF 2015 report, Finland ranked 2nd in the Network Readiness Indicator. Most of the top ICT companies want to deploy their data centers in Finland for several reasons, such as cheap electricity, effectiveness and safe environment. Recently, for example, Aiber Networks (Datacore Oy), a Finnish-Israeli start-up company, announced that it was going to build a security data center in Tampere (Talent Tampere - News, 2015).

Case Company

Qvantel Finland Oy is a global 20-year-old IT company whose roots are in the pre-internet era in Finland. The company was founded in 1995 as a Starnet Systems and in the early years it was focused on Public Switch Telephone Network (PSTN) and billing software for Scandinavian teleoperators.

In 1995, the company got its first telecommunication company client, NordNet. During the next years TDC (previously Tele1 Europe) became a customer who helped the company to expand to Sweden, Norway and Denmark.

In 2000, the focus turned to managing the customer's BSS IT processes, which was one of the key turning points in the company's history. Already in the year 2000, Starnet Systems' customers were able to outsource critical business processes to the company, for example billing processes. Starnet Systems was acquired in 2008 and the name was changed to Qvantel. The merger turned Qvantel to be an international player with presence in India and a more global customer base.

The company kept on growing – in December 2013 Qvantel and Onesto Services signed a merger agreement. This further strengthened Qvantel's offering towards its Service Provider customers to offer designed service concepts where UX design and IT engineering meet. With Onesto, Qvantel gained special BSS stand-alone solutions such as B2B Sales CRM, prepaid integration, credit scoring and sales force management tools. Merger with Onesto gave a wider solution portfolio for Qvantel's customers.

In 2016, Qvantel further stepped up its global presence by opening an office in the USA that will serve the fast-growing telecommunications market in the region. Today Qvantel Group employs approximately 800 professionals in Finland, India, Sweden, USA, Estonia, and Spain as shown in Figure 24.
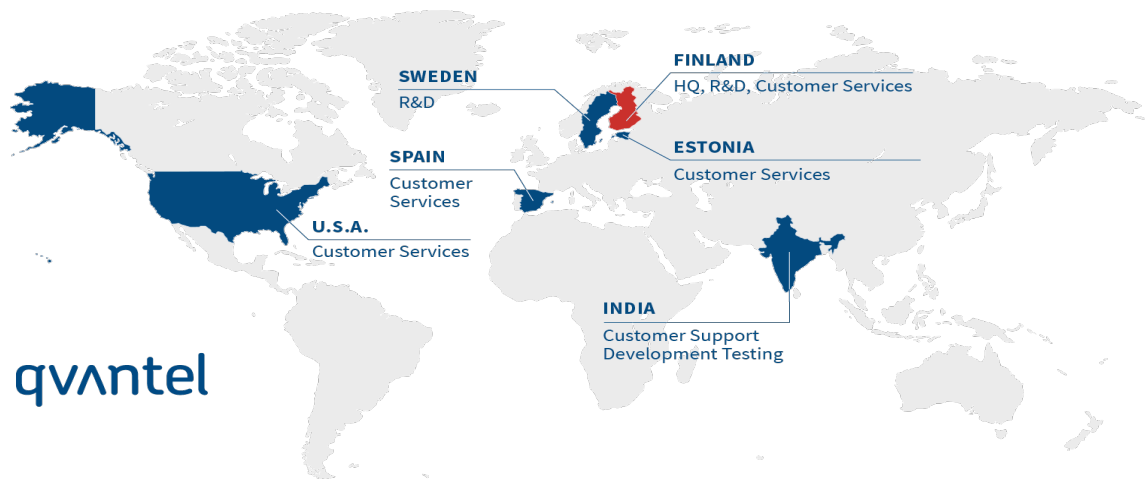
Figure 24. Qvantel offices located in geographical locations
(Qvantel website 2016)

The company is getting new customers by selling their digital front-end BSS products and at the same time focusing to increase revenue from existing customer's operations team by providing satisfactory services & support based on their daily needs. This is a big challenge for company to focus on delivery teams and existing customer operations team at the same time. The company has been progressively increasing the headcount in geographical area and this is leading in a situation to handle the projects in distributed locations with cross-culture differences. Lately the customer operations team were struggling with quality related issues in the project management processes. Some of the projects were failed to meet the delivery schedule or customer expectations.

3.3 Data Collection

The kinds of empirical data were collected in the study: secondary data from the case company - documentations related to project quality management and processes followed by the company and primary data from semi-structured interviews. In the qualitative research approach, semi-structured interviews are often used for collecting the necessary data and insights of the topic (Eisenhardt, & Graebner 2007, 28). Qualitative research methods, such as interviews and observations are dominant in the naturalist (interpretive) paradigm and supplementary in the positive paradigm, whereas the use of surveys serves quantitative research Golafshani (2003, 600.)

A comprehensive documentary analysis was conducted in order to familiarize with the project management processes followed by the case company. This also helped with familiarizing with the company's quality management and with what kinds of challenges they had faced in the past in securing project delivery and quality. Subsequently, the researcher used these documentary analyses and his own observations as a secondary data for preparing the interview questions. The researcher had access to the case company's internal documentation repository.

The semi-structured interview was chosen for the collection of the primary data. This was done for gaining a practical view and understanding of the challenges that the case company had faced in project quality management. The interviews were planned based on the theoretical framework as defined in Chapter 2, and preliminary information was collected from the documentation repository. In qualitative research, the number of interviews is not defined. However, it is important to ensure that how many interviews are sufficient for collecting the necessary data.

The persons interviewed in the study were chosen from the case company as part of the customer operations account in Europe. The persons interviewed were in the role of project managers and quality analysts. The interviews were conducted between the 16th February and 15th March 2017. The preliminary interview questions were sent to interviewees beforehand so that they could have enough time to familiarize themselves with the objectives and bring potential information that would enrich the interview with more discussion and insightful information. The interviews questions were categorized into two main themes such as project management and quality management as shown in Table 2 below:

Table 2. Interview themes

Quality Management Themes	Project Management Themes
Quality Planning	Project Initiation
	Project Planning
Quality Assurance	Project Execution
Quality Control	Project Monitoring & Control
	Project Closing

The themes were planned according to the literature review in Chapter 2 in order to cover the research topic broadly. A total of two expert interviews were conducted by the researcher himself in the study. The interviewee in the first individual interview was an expert in the area of quality analysis, and three interviewees in the second group interview were experts in the area of project and program Management from the case company's customer operations team. The approximate length of the first interview was sixty minutes and in the second interview approximately ninety minutes, which was significantly longer because of more content and group interview discussion. A list of the questions used in the interviews is in Appendix 1. The interviews took place in the case company's premises face to face. The interviews were recorded with the permission of the interviewees. The voice recorder of an Apple I-phone smart phone was used to record the conversations. The interviews were carried out in English, since the researcher was not a native speaker of Finnish. However, both the researcher and interviewees were comfortable with the English language because of it being a common working language in the IT-industry.

According to the qualitative research approach, data collection and data analysis were carried out hand-in-hand. This meant that the researcher transcribed the interview and analyzed it before the next interview so that it provided more information for next interview. After analyzing the content from the first and second interviews, it was observed that the answers and suggestions were similar and therefore, it was not necessary to conduct further interviews for the study.

3.4   Data Analysis

A coding method was selected to analyze the data in the study. According to Dawson (2009) for qualitative data, the researcher might analyze the research progress, continually refining and reorganizing them in light of the emerging results. At the one end, there are highly qualitative data and reflective types of analysis, whereas on the other end, there are qualitative data presented in a quantitative way, by coding it. (115-116.)

After conducted the interviews in the data collection section 3.3, a transcript of the conversation was written by replaying the recorded file. This process provided an opportunity for obtaining the accurate answers, and analyzing the responses without the danger of subconsciously relying on the researcher's own, possibly biased notes or preconceptions (Eriksson & Kovalainen 2008, 85). The recorded audio interviews

produced more than twenty-five pages of the transcribed texts. The researcher transcribed an interview and analyzed it before the next interview so that it provided more information for the next interview.

As the data in this study was at a manageable level, the analyses were completed during the research with no special software used in analyzing it. Instead an open coding method, a line-by-line analyzing process was used. The process was considerably time consuming, but however it gave the needed detailed information. First a 'big picture' of the data collected had to be found. This took place by reading the data a few times and when the data was familiar, it was time to focus on certain aspects and correlate what was mentioned about different themes in the theoretical framework. After each transcribed interview, it is copied to excel sheet and placed the original quotations made by interviewees in the excel sheet according to the main themes and codes those were derived from the theoretical framework. Charmaz (1983, 112) argues that codes serve to summarize, synthesize, and sort many observations made of data. Coding becomes the fundamental means of developing the analysis. The researcher formulized the original quotations spoken by interviewees to be more descriptive expressions. Table 3 below shows an example of columns including the original quotation, descriptive expression.

Table 3. Data analysis from original quotation to descriptive expression

Original quotation	Descriptive expression
No risk register… Well Portfolio sounds like, gathering all point of view than individual, like a team. We have plenty of projects, approx. 40 project deliveries in last year and it could be very useful.	Maintaining a risk register in project portfolio level might be very useful and provide lot of data and previous experience to mitigate the risk.

Next, the original quotations were arranged in the excel sheet with explained project quality management themes and specific codes that researcher was aimed to study in this research. This excel sheet helped to apply data reduction approach with coding method so that similar things can be grouped together and summarized them in an effective manner. Table 4 shows below is an example of the excel sheet.

Table 4. Data analysis, full view from themes to descriptive expression

Theme	Code	Name	Original quotation	Page#	Descriptive expression
Quality planning	TP	Test planning	When starting a new project, it could be good to go through similar types of setups. And similar kind of expectations, for example, scope or schedule. As you were saying it is about big or small projects. I would say anyway we need testing in every project in similar way. If its complex and many dependencies then it is different story, for example, if you are changing existing functionality radically then in a way that it's going to be resulting more regression work.	2	**Customer perspective:** Customer don't want to face any issues in the production, it means the quality needs to be good. **Project management perspective:** we can see that testing as an investment if something extra need to do.

3.5   Verification of the Results

According to Noble and Smith (2015), a qualitative research is often criticized due to lack of scientific rigor with poor justification of the methods adopted and lack of transparency in the analytical procedures. The findings are considered as a collection of personal opinions and subject to the researcher bias. The nature of the qualitative research method does not use statistical or empirical calculations of validity. The qualitative researchers seek fundamentally the same ends through different methods which are better suited to a human subject matter. A large number of authors those are focusing on qualitative research methods have suggested tactics or strategies that researcher can employ for enhancing the truthfulness or validity of qualitative findings (Brink 1993, 35).

A good qualitative study can help researchers for enriching the content and insight of the topic. A qualitative research has a main purpose of "generating understanding", whereas the reliability is a concept for evaluating quality in quantitative study with a "purpose of explaining" (Golafshani 2003, 601).

Validity and reliability are key aspects for any kind of research. The sensitivity and attention towards these two aspects can make the difference between a good research and poor research. The researcher needs to be attentive and aware of with the multiple factors those may impose risks to the validity of findings, plan and implement various tactics or strategies into each stage of the research project, for avoiding below mentioned threatening factors. One of the key factor's affecting validity and reliability is an "error". An "error" is inherent in all the investigations, data analysis and data collection and it is inversely related to validity and reliability. The greater the degree of error in the research, the less accurate and truthful results. Therefore, the researchers must be sensitive and careful of the sources of error when planning and implementing their studies. The major sources of error can be categorized as follows (Brink 1993, 35):

- Researcher's personal biases which may have influenced findings
- Acknowledging biases in sampling and ongoing critical reflection of methods
- The subject matter experts participating in the study
- The situation or social context
- The methods of data collection and analysis

The researcher himself played a vital role in the study from collecting relevant literature reviews to conducting the expert interviews in the area of project quality management. The researcher also executed the following tasks such as, theoretical framework to address research questions, open-ended questions for the interviews for a deeper understanding and enriching the content and involve interviewees for effective discussion, and finally data analysis with a coding method wherein themes and codes were derived from theoretical framework. The researcher was sensitive and careful in validity and reliability of the data collected in the study and eliminated possible bias results. The credibility of the research depends on the ability and effort of the researcher.

Furthermore, it is significantly important to evaluate the reliability and validity of the literature reviews conducted and the choice of the theoretical framework in the study.

It is crucial to recognize the possible bias of the sources used. Therefore, the researcher was careful and ensured that the materials was collected from books by acknowledged, well-respected authors or publishers and articles of academic background were utilized. In addition, some material was accessed from the different public sources such as using google scholar article search tools, project management institution official sites, prior researches in same field - based on publisher or the organization behind the information and left any suspicious sources out.

Moreover, this study was performed for evaluating only one customer operations account in the case company therefore, it must be acknowledged and underlined that the results derived from this study cannot be generalized to be applicable in other settings or in other case study. The research was aimed to be relevant for IT Project Managers in the case company and can be utilized in some extent by Project Management practitioners in IT industry. In addition, the expert interviews were conducted in the case company for understanding the processes followed by the case company and problems which have been faced in past. However, the fact is that the findings obtained from both the case study and the expert interviews were considerably similar.

4   RESULTS

In this chapter, the results of the conducted empirical study are presented. As the research approach was based on qualitative research therefore, the researcher's intention is to provide interpretive and synthesis results corresponding to the research questions instead of solely statistical form of results.

4.1   Challenges in Project Quality Management

The most important challenges which are faced by project managers on daily basis in project quality management were discussed during the interviews. The researcher focused during the empirical study that what kind of challenges the case company had in past in their project quality management, and how they had overcome those challenges.

4.1.1 Inappropriate Choice of Project Methodology and Model

The choice of a project methodology is a key factor for the project based companies. The project managers must have knowledge and skills in the project management area for evaluating right project methodology for their daily needs. The inappropriate choice of a project methodology might cause serious issues in the project management processes and some of those could not be solved by project management tools or might incur internal cost to the company.

The interviewees from the case company also agreed that the choice of a project methodology has an importance in the project management. The selection of a project methodology should be based on the project manager's daily needs. Sometimes it is not possible strictly following the kanban, scrum or other agile framework, and if it is mentioned that scrum must be followed, then project team starts taking seriously and following each and everything related to specific term and that might reduce the agility in the project management.

Lately, it has been noticed that the project based companies are more focused and educate their employees in the role of project management by providing proper trainings and certifications. As survey statistics mentioned in Chapter 1 that 68% of projects meet project deadline and quality standards if the company follows a project methodology. There are various types of project management methodologies are available and those fit to different purposes. Table 5 shows below explain strength, weaknesses and purposes of different project management methodologies:

Table 5. Project management methodologies
(Aston, 2017)

Methodologies	Strength	Weakness	Best suited for?
Waterfall	Predictable	Inflexible	Stable requirements, low to moderate urgency. planning projects fully, then executing through phases
Agile	Fast & iterative	Uncertain result	Flexible requirements, high urgency. Collaborating to iteratively deliver whatever works
Scrum	Fast, iterative and adaptive	Full solution is not provided from day one	Enabling a small, cross-functional, self-managing team to deliver fast
Kanban	Better visibility	Limiting multi-tasking and focus on small part (not full solution)	Improving speed and quality of delivery by increasing visibility of work in progress, and limiting multi-tasking
Lean	Focused on streamlining and cutting out waste, better efficiency	Need expert resources	streamlining and eliminating waste to deliver more with less
PRINCE2	Structured project processes and controlled	Less flexible	Controlled project management that leaves nothing to chance
PMI's PMBOK	Clearly defined project processes	Less flexible	Applying universal standards to waterfall project management

Moreover, every project management methodology has different characteristic or set of characteristics. Agile project management methodology simply defines principles, nothing more. PRINCE2 methodology defines a 'full-stack' methodology framework of themes, principles, and processes. Some of the methodologies are followed an extensive list of standards with processes, like PMI's PMBOK & XP and some are very light weighted methodologies which simply define processes, like Scrum & Kanban as shown in Figure 25 below.
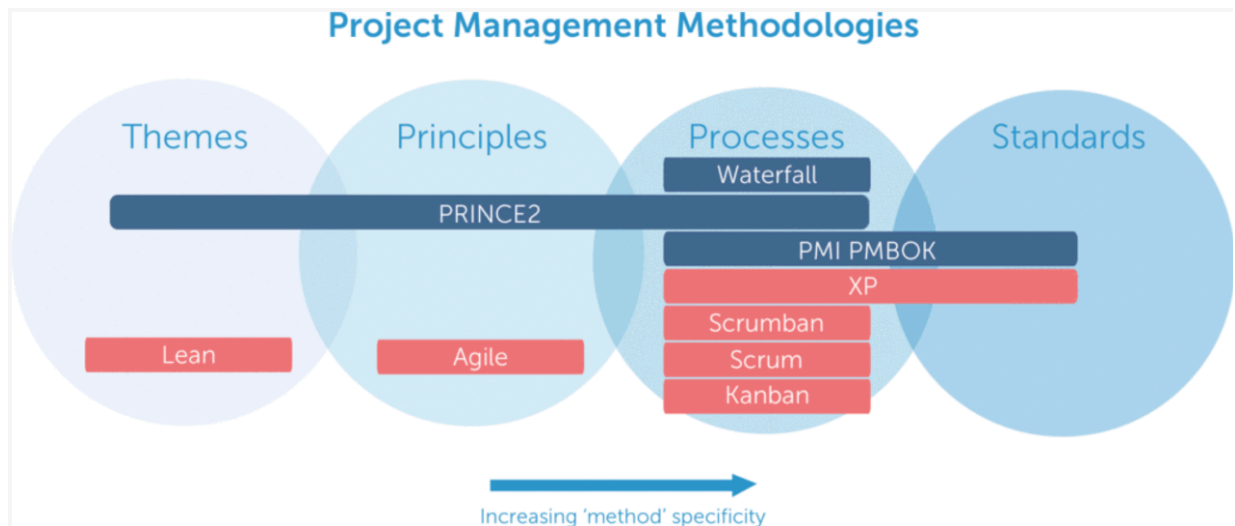
Figure 25. Project management methodologies
(Aston, 2017)

Therefore, while deciding which project management methodology to be used in a specific project or company-wide, the company needs to consider the simplicity or complexity of the project, the client, available resources and the project constraints (including the appetite for change and risk), timeline, tools, and people. Eventually, the project methodology should be chosen based on the following criterion: ability to deliver the most value to the customer, cause least impact on delivering it, meets organizational goals and values, the list of constraints the project team has to dealt with, the importance of stakeholders, the risks involved, project size, cost, and of course the complexity of the project.

The respondents mentioned that the case company is using a tailored project methodology which is developed based on industry standards and compatible with PMI's PMBOK, Prince2, Agile and adapted common practices and base lines from the standard methodologies. The selected methodology was tailored in such a way to support daily work and tackle daily project concerned issues. Considered only the parts which are absolutely needed, effective in project's daily and wanted to tackle practical issues rather theoretical. Moreover, there are lot of similarities with other project management frameworks and processes such as, PMBOK, case based approach and other processes areas like project planning, project execution, project closure as defined in PMBOK.

4.1.2 Projects Execution in Distributed Locations

The project execution in distributed locations is a known challenge in the project management. Managing the resources and processes are complicated to handle from different locations. Most of the project managers always complain that communication between project members is affected if the team is partially located remotely. There have been lot of suggestions how to improve the communication with the team located remotely, examples: online communication tools (Skype for business, Hipchat or Slack etc.) and in addition using video conference call to ensures that attendees are present and improve the interaction. However, there could be few other reasons those make the things complicated as mentioned below:

- Communication
- Time-zone
- Cultural differences

However, the companies still want to deploy the resources and knowledge in different locations for gaining the competitive advantages. Of-course there could be other considerations for handling the projects in different locations such as lower operations cost in Asia Pacific, get easily desired resources and possibility to grow in future.

The respondents from the case company briefly discussed these challenges from the case company point of view since the case company is recruiting resources in different locations to execute the projects. Finland is a main location in the case company point of view and part of development and testing teams are also located in Spain and India. Definitely there have been some challenges in handling the projects in different locations but mostly issues are related to individuals. There could be some individuals those are located on main site but still they are not willing to contribute much, don't want to attend meetings or don't understand the processes very well. But some of the individuals are located remotely and they are doing their work properly and follow the processes. Although, the project managers need to put much more attention on communication to ensure that communication is smoothly happening between the project teams.

4.1.3 Normal vs. Fast Track Projects

Managing the fast track projects is a biggest challenge in IT project management. Most of the IT companies are struggling to manage fast track projects because the customer requirements are changed over the time and do not freeze until last minute. The continuous changes in the business requirements require companies moving towards agile processes so that they can give flexibility and agility to business processes.

The project team do not get enough time to deeply understand the requirements because of shorter delivery schedule and which might cause serious quality issues in the project delivery. However, this is a known issue and in some cases, risks in the quality is acceptable by the customer. Moreover, there could be some situations when business requirements were not understood well and failed to meet the customer expectations or delivered the project late therefore in both cases company managed a failed project. On the other hand, project team get enough time to properly handle the normal projects and follow the necessary processes and checklist to make sure that desired quality is included in the delivery.

The interviewees from the case company also discussed about fast track projects and how do they handle the fast track projects in comparison to normal projects. Interviewee quotation "*We don't have much time to setup or follow the desired processes in fast track projects.*". The project supposed to be started in fast pace even though full business requirements were not provided on-time or not do not get enough time to analyze thoroughly. In some extent, it is a joint understanding between the customers and the case company when talking about fast track projects, we both approve the bigger risks and ready to tackle those bigger risks.

Example: The case company has obligation to pay penalty if the operations KPIs do not meet the target, and of course if something new deployed in operations that is developed in fast track schedule might introduce some problems or unexpected issues. However, in those scenarios the case company agree with customer to get exemption on those SLAs and possibility to exempt the penalty.

Project managers in the case company prefer to execute light weighted checklist and project planning sessions. But however, sometime those steps are done in different

orders depending on the schedule. The following are the possible items to be considered in fast track projects:

- Solution design and development goes hand-in-hand and involve experts in the quick solution design
- Same quality check list but executed more often
- Possibility to bring project team at one place (called War room)
- Light weight test automation is considered. Improvement to test automation is managed later
- Daily stand-up meeting with focus on blocker issues
- Skip non-critical project processes, like: offer, formal solution review, project closure
- Schedule risk is most critical, cost and quality risks are agreed with customer

4.1.4 Customer Involvement in Project Life Cycle

Motivating the customer and increasing their participations in project life cycle is also a challenge for project managers and portfolio management. It was observed in past and mentioned in different project management events that less customer participation has direct impact on the project results. This might cause the following impacts on the overall project management:

- Less customer involvement brings quality issues in the delivery
- Difficult to address blocker issues and risk management in fast pace
- Direct impact on project results
- Lack of enthusiasm in the project life cycle
- Less customer relationship and interactions

The company should take this as a challenge and focus on how to increase the customer participation in the project life cycle. Here are the followings ideas those came up during the discussion with interviewees and few of them have been tested in the case company:

- Motivate customers through project results. Briefly explain the scenarios to customers and implications if the customer participation is low then there will be impact on project results.

- Motivate customers through face to face discussion and explain the benefits of using project methodology and outcomes of it.
- Motivate customers through giving demo of the developing features (which are requested) and get customer feedback.
- Sometimes strict deadlines for certain project milestones, otherwise warn customers in advance if schedule is in risk.

4.2 Quality Activities to Identify Risk Factors in Project Management

The researcher aimed to provide synthesis results of the first research question in this section. This section explained quality activities those were adapted by the case company for identifying the risks factors in the project management. However, some of those quality activities can be generalized and used by other project based company in IT and telecommunications industry.

4.2.1 Risk Management in Project Portfolio

The risk management in project portfolio is relatively important when a company manage several projects in parallel. The risk management become critical factor when many stakeholders are involved and project is handling in distributed locations. Usually, the project managers do the risk analysis in the individual projects and often risks are materialized during the project. However, it has been noticed that risk register is not maintained during the project and similar risks are occurred again in other projects.

The respondents from the case company also mentioned that maintaining a risk register with proper risk categorization and project type is a benefit. It might help in other projects to verify whether similar type of risk was identified earlier. In addition, it is good to have visible, documented somewhere and accessible by PMO and it will help to find out what kind of issues we have had in past. Nevertheless, risk management might not turn into to solve the full problem but perhaps on portfolio level it might benefit, because in the case company we have set of standard risks apply to all the projects and materialized often same risks, which are due to resource planning, schedule etc.

The following key processes were pointed out during the interviews those give strength to risk management on portfolio level:

- Risk categorization:
    - Software related risks
    - Quality risks in fast track projects
    - Schedule related risk
    - Cost related risk
    - Resource management risk
    - Knowledge sharing & building risks
    - Risks related to project team composition
    - Operation handover risks
- Resource planning on portfolio level
- Risk register on portfolio level
- Weekly project portfolio and roadmap meetings with stakeholders
- Visualize roadmap with ongoing and planned projects and accessible by PMO

At the moment risk categorization and documenting risk during project life cycle is a matter of individual project manager and his/her personal interest. They check the work effort what we have vs. budgeted amount and check the risk. Few project managers tried to make some visual using Gantt chart or burn-down chart to check if there is any dependency. From that point of view, some sort of cost and/or schedule risk can be evaluated. There is no such process defined in the case company in portfolio management that enforces project managers to maintain the risk register. Moreover, risk should be identified and followed by project team. Project manager should write the risks in risk register and categorize it but project team should understand criticality of the risks. At least it is very important for big size projects and some practices should be in-placed.

4.2.2 Lean Project Quality Model and Activities

Project quality model is a key for the project based companies and how the project quality activities are integrated with project management model. The enterprise companies invest heavily in developing the project quality model to comply for ISO (International Organization for Standardization) or CMMI (Capability Maturity Model Integration) standards. However, it is becoming necessity for small & medium size companies as well to develop project quality model to comply quality standards for building long-term relationship with customers.

Presently, the case company is using light weighted tailored project quality model which include certain quality processes and activities to accomplish the project management daily needs. There are three key milestones related to quality processes which are integrated with project management model as demonstrated in Figure 26 below.

- **M0-Quality planning:** this milestone covers high level planning of what type of project it is, how many integrations are required, what type of functional testing is needed and complexity of the project.
- **M1-Quality introduced:** this milestone makes sure that quality parameters are introduced, documented and agreed with stakeholders.
- **M2-Quality assured:** this milestone assures that desired and agreed quality is being implemented in the project delivery.

Moreover, the case company project quality model additionally supports two project quality activities those help project managers to follow-up the quality checks on daily basis during the project life cycle:

- **Quality checklist:** light weighted checklist which contain main points those must be reviewed and agreed with stakeholders.
- **Quality matrix:** this is one of the process in project closure report that project managers need to prepare end of the project. The quality matrix includes the following information:
  - Planned vs. delivered schedule
  - Planned vs. actual work estimation
  - KPIs: how many SL (Severity level) tickets were opened, internal bug tickets and operational readiness
  - Test automation coverage
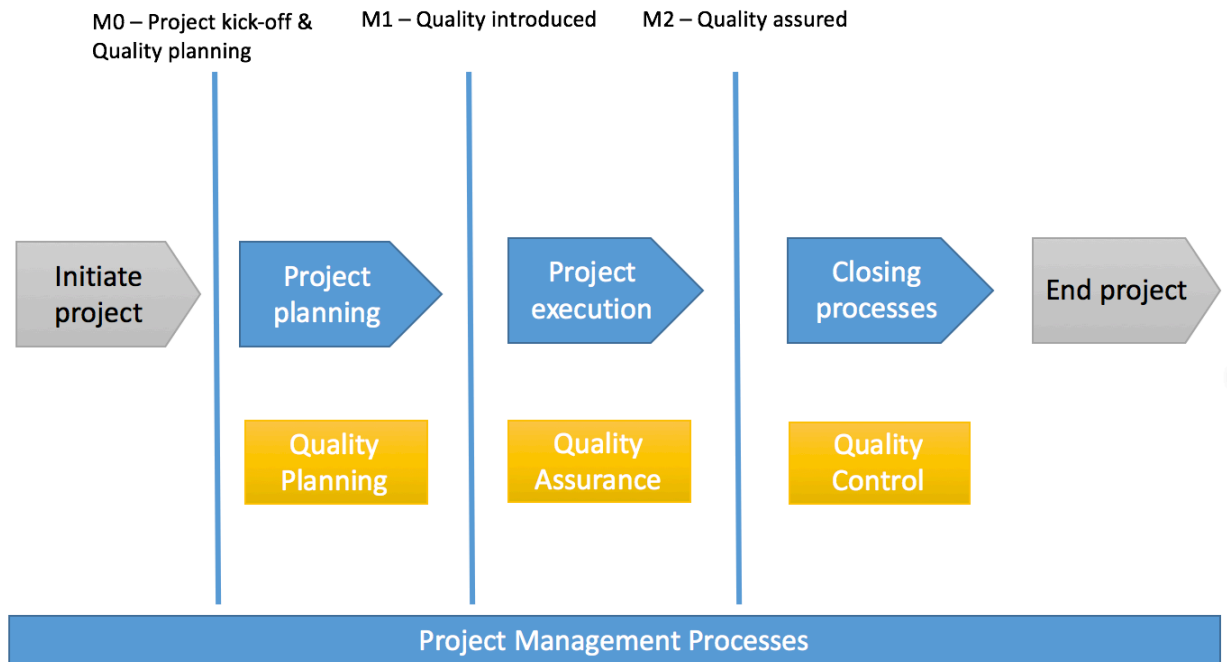
Figure 26. Lean Project Quality Model and milestones

Currently, the case company is lacking with insufficient governance in their quality model. The case company used to have quality manager in past who was responsible to validate the matrix but now this advantage or process don't exist. Now it is a project manager whole responsibility to cover all the areas in the matrix and there is nobody responsible to validate the quality matrix produced by project managers for each quality processes.

4.2.3 Quality Assurance and Control in Project Management

Quality assurance and control is a big challenge for IT companies especially with fast track projects. The business requirements evolve over the time and project managers do not get sufficient time to put together all the quality processes and execute checklist. The IT and telecommunications market is quite challenging because of business needs high level of agility in the project management processes and project deliveries. Therefore, IT service providers supposed to execute the projects on fast pace for keeping the commitment and gaining competitive advantage.

The respondents from the case company mentioned that they do not get sufficient time to setup the quality processes and checklist and execute them in proper manner. Some

of the project management processes are managed after the project (or part of project) is delivered to customer, here are some examples:

- Send cost offer to customer
- Implement test-automation
- Fulfilling quality matrix
- Operations hand-over and demo to internal team
- Documentation and user-guide for customer

In fast track projects, the project planning and execution is handled at the same time, not much time to plan thoroughly quality pressure-points and measurement since the project must be started in quite fast pace. In most of the cases, business requirements are provided uncompleted and there could be a risk that we might end-up developing something unnecessary feature which was not required. However, it should be a joint understanding between customers and the case company when talking about fast track projects, both approve the bigger risks and ready to take those risks. What we are doing these days with fast track projects is to communicate to customer that quality might be at risk. We agree how to accept that together.

The monitoring and control is a key process in the project management, and quality assurance and control is one of the sub-process. The project success depends on how much project team pay attention to monitoring and control and what kind of processes, checklist is integrated in this process. In some occasions, it is also possible that project team identify risks or uncertainty during development and require higher attention from different stakeholder to manage the risk.

The Figure 27 demonstrated below shows the key monitoring and control processes in project management.
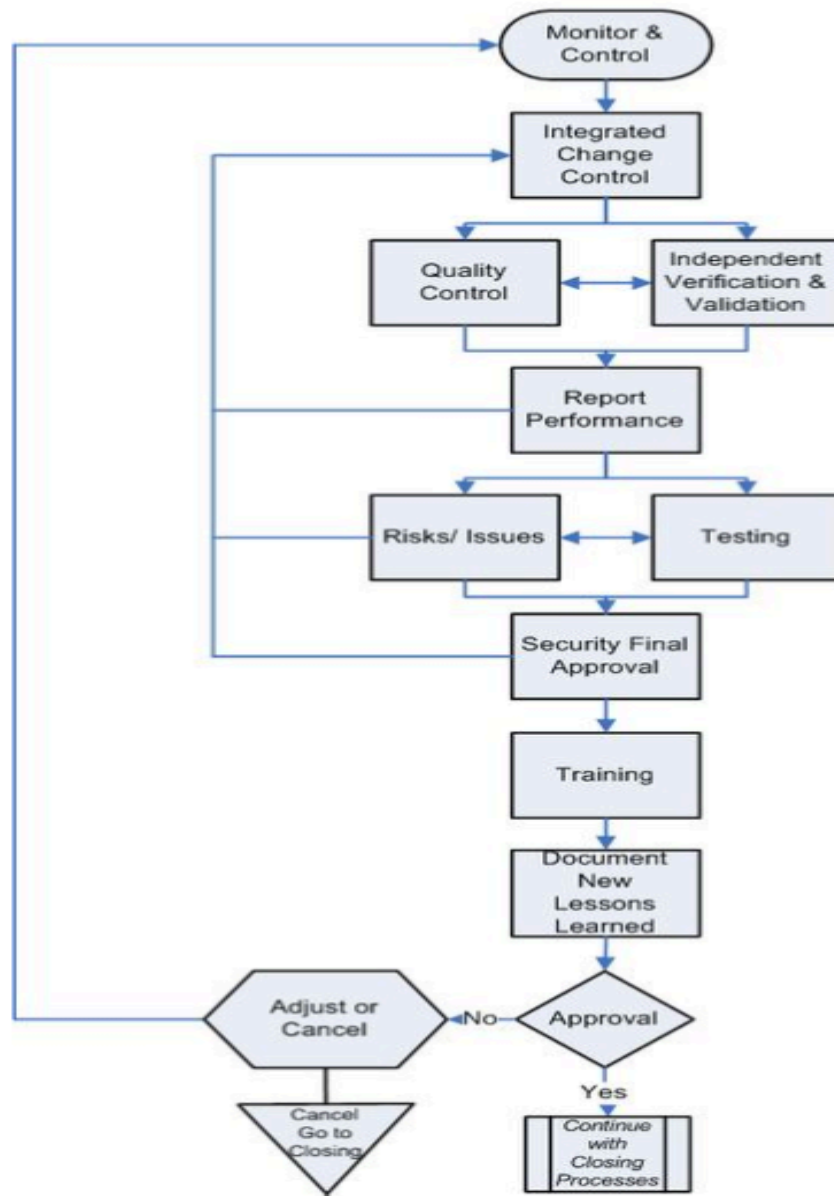
Figure 27. Project monitoring and control processes flow
(Project Management Process Guidelines Flow Chart, 2013)

According to the interviewees from the case company, the monitoring and control is an important process and following activities are carried-out:

- Follow burn-down chart in Jira tool
- Daily stand-up meeting with project team
  - to quickly check the tickets status
  - notify if any blocker issues
  - plan for next day
- Carry out quality activities and measurement

4.3 Improving Total Earned Values in Project Management

The researcher aimed to provide synthesis results of the second research question in this section. This section explained the project quality management practices which were adapted by the case company for improving the total earned values. However, some of those quality practices can be generalized and used by other IT project based company.

4.3.1 Project Portfolio Model

Presently, the big IT companies support Project Portfolio Model (PPM) as shown below in Figure 28. This model consists of several flexible capabilities such as, combine project milestones with project steps and distinguish responsibility and accountability in each milestone, and clear project progress tracking. In addition, each swim-lane in the model has own processes, governance and corresponding milestones.

There could be many stakeholders and responsible persons in the project milestone. In PPM model, whole project team is involved when a project is introduced and project team is participated in the solution designing and technical architecture depending on the need. Project Manager is mainly responsible for coordinating with different stakeholders involved in the project and make sure communication goes through properly.
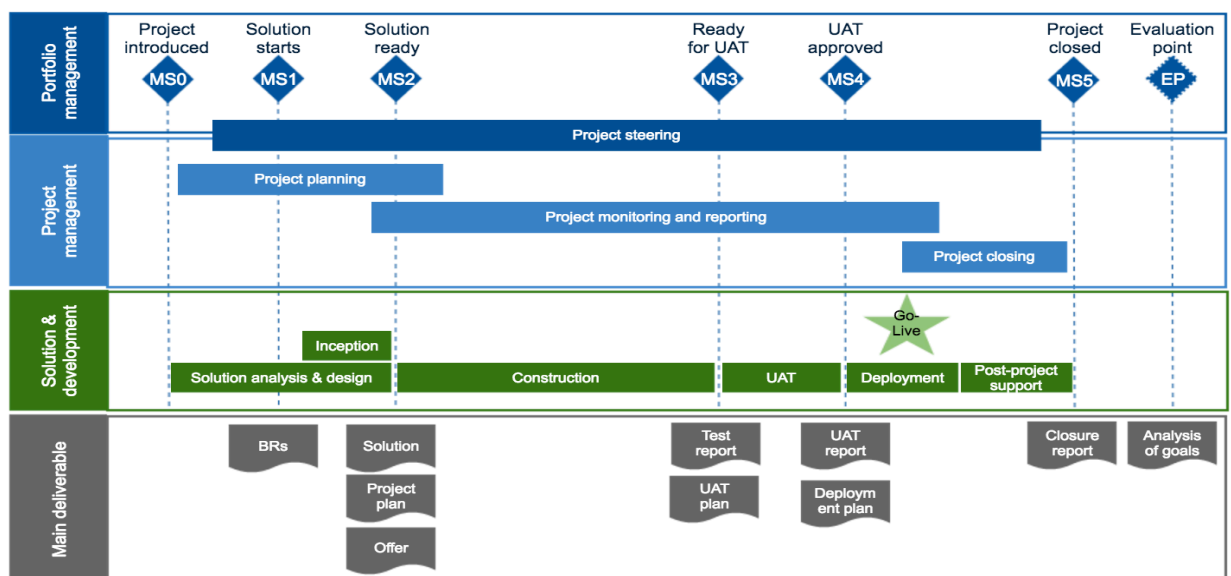

Figure 28. Project portfolio management model

The solution manager is responsible for solution designing and documenting with the help of Architects, UX designers. During user acceptance testing phase, testing manager will ensure that everything is in-placed in the environment and ready for user testing. The defects being raised by users will be fixed before the deployment. Once the product is deployed in product environment then manage post production testing and involve users to give better experience.

The interviewees revealed that the case company is also using tailored project portfolio model. The project management processes and practices were adopted from different project methodologies developed based on industry standard and compatible with PMBOK, PRINCE2, Agile. The overall project portfolio model provides the control over the following things:

- Project management processes and guidelines
- Best practices and checklist
- Matrix
- Generic templates
- Customer KPIs

The importance of templates is to document necessary themes related to the project and quality management and avoid certain risks due to inaccuracy in the documents. We built in quality into templates. At the moment, the case company is lacking in two different areas:

- **Governance:** currently there is no one is responsible in the case company to verify quality in the project management. The project managers are responsible to follow the processes and complete the project closure reports based on defined template.
- **Agility in project portfolio management:** the business needs agility in the project management processes and it is really difficult to increase agility without proper portfolio management and it is also important that both customer and vendor follow the same project management processes and guidelines to make synergy in the processes and change management.

4.3.2 Lean PMO Setup

Due to globalization, companies are forced to be dynamic and flexible in the project management processes. Executing parallel projects simultaneously is a most common trend in the IT companies for gaining competitive advantage and operational effectiveness. Lately, enterprise IT companies are setting up centralized body of PMO for improving the project management in the organization, and ensures that single project model and processes are being developed and used to improve operational effectiveness.
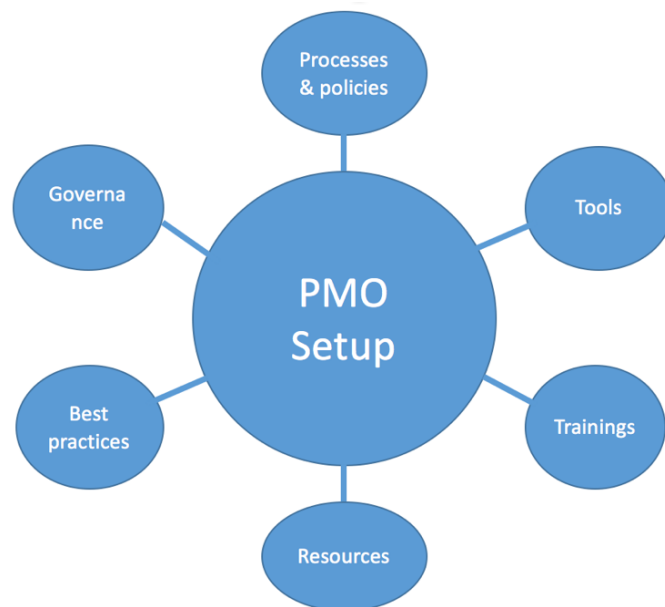
Figure 29. PMO setup

The researcher himself was interested to understand from the case company point of view that what kind of PMO setup do they have and how do they manage the project management processes. The interviewees explained briefly that the case company do not have company-wide PMO. The lean PMO and practices are in-placed for each customer operations and delivery teams. The team specific PMO is defined light weighted that cover basic needs of the project management and governance on the processes and policies. However, the main focused on communication and synchronization between PMO members and checking roadmap status. The following activities are carried out part of PMO:

- Weekly PMO meeting to discuss roadmap
  - Raise concerns if there is a conflict in the project schedule or resources
  - Prepare action list with deadline for each item
- Online official chat room for PMO on Hipchat tool
  - Discuss daily issues related to project management
  - Raise issues if immediate action is needed
  - Information sharing
- Quarterly PMO workshops
  - Add/change in the project management processes and policies
  - Add/remove tools in project management (if needed)
  - Improvement ideas
- Weekly resource planning meeting
  - Update resource planning excel sheet with ongoing/upcoming projects
  - Discuss with team managers what type of resources are needed
- Weekly team highlights
  - Short weekly stand-up meeting with team to inform what is happening in the coming week
  - Information sharing with team

It is really valuable to have PMO in team specific so that concrete actions can be taken place easily. Going forward in future if the case company decides to have common PMO in company-wide then all the teams should follow common project methodology. It will give more benefits to bring resource planning, resource allocation and developing standard processes on company-wide.

4.3.3 Earned Value Management

Earned value management (EVM) is a popular process to calculate the cost and schedule performance of the project. However, it was noticed from the earlier literatures that EVM is significantly useful for long-term projects rather short-term software development projects. In short-term projects, project manager can easily calculate the earned value from allocated budget and actual cost, and sometimes even it is not necessarily needed. On the other hand, long term projects or program require some processes or practices to be in-placed to measure the project performance. The following are the key objectives of the EVM (Humphreys, 2012):

- o Relate time phased budgets to specific contract tasks and/or statements of work
- o Provide the basis to capture work progress assessments against the baseline plan
- o Relate technical, schedule, and cost performance
- o Provide valid, timely, and auditable data/information for proactive project management analysis and action

From the case company point of view, EVM process was proposed in past to adapt in team specific PMO but there are certain limitations that restrict using EVM process:

- 80% of projects are small size (1 month), 10% of projects are medium size (2 months) and remaining are large size projects (more than 2 months)
- Technology uncertainty in software development projects
- Difficult to get reliable data from JIRA tickets (some people are not interested to log the hours accurately)

However, the team specific PMO is following similar EVM process in light weighted form. Once the project requirements are analyzed then project or solution manager split those business requirements in to small (or possibly equal size) user stories in JIRA tool for project team. Later on, project team is responsible to estimate the work effort for each user story that is planned for the project. Figure 30 shown below demonstrate how the breakdown of business requirements is done into small user stories.
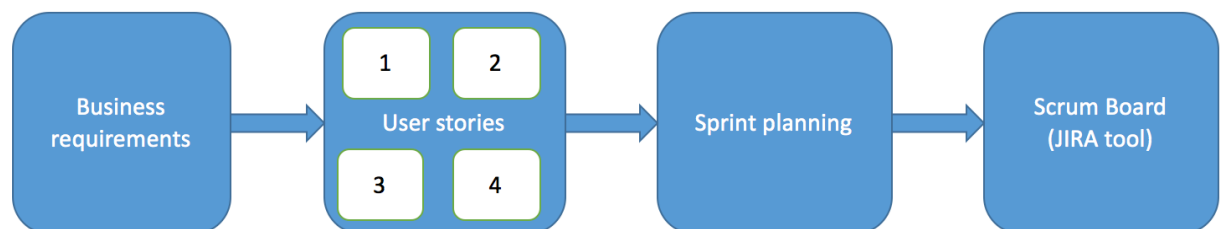
Figure 30. Business requirements to user stories on scrum board

The project manager calculates "Budgeted cost for work performed (BCWP)" in two ways and choose the one which is more realistic:

- Total planned estimations marked on user stories for work performed
- How many resources were planned to deliver the project
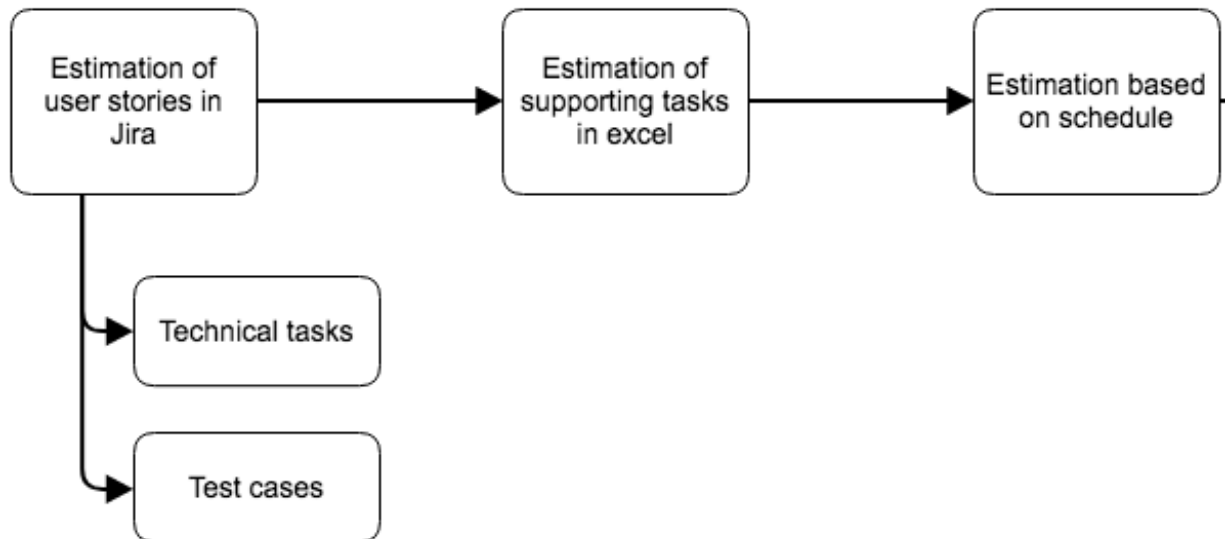
Figure 31. Estimation of user story vs. estimation based on schedule

In next step, during the project execution, project team is responsible to log the actual hours when user story is completed. This is difficult thing to log the hours accurately on tickets because it requires self-motivation on personal level to log the hours timely to avoid mistakes. However, it is project manager responsibility to ensure that project members are filling the hours and those are used to show the breakdown chart and performance of the project on timely basis to project team.

Figure 32 shown below represent the summary of the project and breakdown chart on JIRA tool.

Period		Created	Resolved	Trend
Week 26, 2017	⌃	0	2	-2
Week 27, 2017		3	1	0
Week 28, 2017		4	1	3
Week 29, 2017		0	2	1
Week 30, 2017		4	2	3
Week 31, 2017		2	1	4
Week 32, 2017		3	3	4
Week 33, 2017		1	2	3
Week 34, 2017		1	1	3
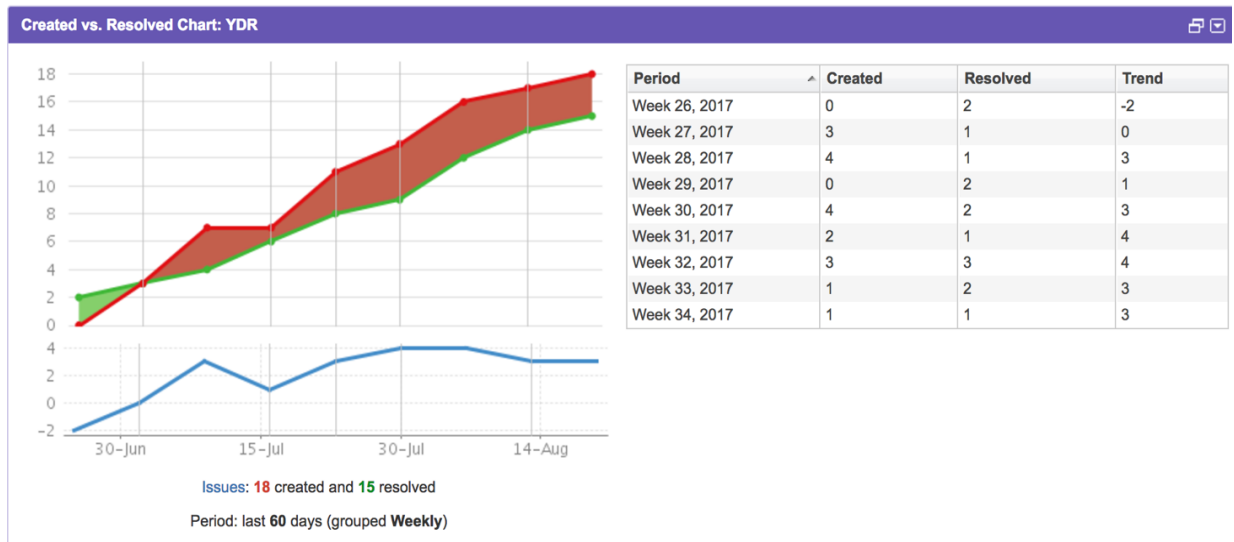
Figure 32. JIRA tool to show project summary

Last step in the project life cycle is to prepare the closure report once the project is delivered and project manager is responsible to fill the closure template with following information:

- **Planned value (PV):** The approved budget for the work scheduled to be completed by a specified date; also referred to as the *budgeted cost of work scheduled* (BCWS). The total PV of a task is equal to the task's *budget at completion* (BAC) — the total amount budgeted for the task.

- **Earned value (EV):** The approved budget for the work actually completed by the specified date; also referred to as the *budgeted cost of work performed* (BCWP).

- **Actual cost (AC):** The costs actually incurred for the work completed by the specified date; also referred to as the *actual cost of work performed*(ACWP).

- **Schedule Variance (SV)** = Earned value (EV) – Planned value (PV)

- **Cost variance (CV)** = Earned value (EV) – Actual cost (AC)

- **SLA count:** SL1 and SL2

4.3.4 Balanced Score Card

It is really difficult to analyze the deviation from the planning to implementation phase, which include aspects such as quality through traditional project management techniques. The IT companies are adapting new technique called balanced scorecard

(BSC) from the area of management to organization for enhancing the M&C project. BSC main responsibility and function is to detect changes in the market to give rise to organizational changes. BSC has four main perspectives: financial perspective, customer perspective, internal processes perspective and learning & growth perspective (Balanced Scorecard Institute, 2000).

From the case company point of view, one of the customer operation team adapted BSC technique in light weighted form for consolidating the quality measurement aspects. They had defined certain check-points in each perspective areas based on their needs. This process was appreciated by the case company management and for having a quick look of high level quality performance. Table 6 shown below with possible key areas those were included in four different perspectives:

Table 6. Balanced scorecard perspectives
(Case company internal documentation repository)

Financial perspective	Customer perspective	Internal processes perspective	Learning & growth perspective
F1 – Achieve team year expected revenue	C1 – Control customer satisfaction index	IP1 – Internal capability index	LG1 – Control/adjust team capacity
F2 – Meet expected profitability on services	C2 – Control SLA time	IP2 – Improve project estimations	LG2 – Improve team capabilities and knowledge transfer
F3 – Project profitability	C3 – Eliminate bugs in UAT	IP3 – Increase test automation	
	C4 – Comply with development delivery time	IP4 – Control unit test coverage	
	C5 – Meet platform improvement obligation	IP6 – Control bugs workload in testing/UAT phases	
	C6 – Maintain healthy backlog of development tickets	IP7 – Improve test case definition	
		IP8 – Control overtime	

The full-scale level of BSC is of course generates internal cost to company but it might bring back through quality improvement. Other point of view is that currently the case company is executing small size of projects that does not require full scale of BSC to manage otherwise it might bring too much bureaucracy or internal work. However, BSC is appreciated by many organizations and industries for improving the effectiveness of project management and improving operational performance of the project teams.

5 DISCUSSION

The research is concentrated on quality improvements in IT project management. The pre-assumption of the research was that there is no universal list of quality processes or checklist or practices those can be used in every project. But however, the quality processes or checklist can be adapted and customized based on projects need, from different standard quality methods, tools and project management methodologies which are well-known and proven. On the other hand, this customization process requires good knowledge in the area of project and quality management and most importantly it has to be derived from organization perspective and require significant commitment.

The following research questions were formulated to investigate how the quality processes and checklist will improve the overall quality in project management and standardized the project model:

- How can quality activities help to identify the risks factors in project management?
- How can quality control and assurance improve the total earned values in the project management?

The findings of the research were derived from the case study, documentation and expert interviews in the area of project management in the case company. It is certainly possible to draw the conclusion of the study based on the obtained findings and discuss significance use of those.

5.1 Answering the Research Questions

The research aimed to identify main challenges and barriers which affect overall quality in the project management. In addition, find out suitable quality processes and checklist that can help IT companies to overcome quality issues in the project management. Several challenges were identified in IT project management and results to shed some lights on answering the questions as presented in Chapter 4 of the report. However, the purpose of this section is to concisely state the quality issues and how to overcome them, and also ensure that the answers to the research questions become clear and precisely communicated.

The main challenge for project driven companies is to select appropriate project management methodology. However, this require good knowledge in the area of project management and significant commitment from the company management and PMO group. As stated in Chapter 1, according to Wrike statistics (2015), IT projects meet 68% of quality standards when organizations use an appropriate project management methodology and less percentage without any methodology or inappropriate methodology. Furthermore, it has been observed from the findings that it is certainly possible to increase the quality further if the quality milestones are integrated into project model along with tailored project management methodology. The quality milestones help project manager to accomplish the necessary requirements and clearly visualize them whether quality milestone is achieved or not. The following are the key quality milestones:

- Solution review with project stakeholders
- Business requirement inception with project team
- Test planning with Quality Analysts
- User acceptance testing or test result verification by stakeholders
- Product or service transition phase to Operations Manager
- Final step to produce project closure report with necessary information template

Secondly, the poor risk management might cause terrible quality issues or schedule impact on project delivery. In both scenarios, the company will compromise with the competitive advantage. There is a contradiction in the results obtained from the interviews, some of the experts believed that proper risk management followed by standard body of knowledge might bring bureaucracy in the organization and slow

down the project handling for fast track schedule projects. However, the experts were agreed that definitely it will improve quality in the project management and portfolio management. It was also mentioned that there could be a possibility to streamline the risk management processes and adapt what is necessary based on the projects need and avoid heavy internal costs from operational perspective.

Thirdly, quality control and assurance is another big challenge for IT companies especially with fast track projects. The business requirements evolve over the time because of high competition and uncertainty in the global market. The IT and telecommunications marketplace is quite challenging because business needs high level of agility in project management processes and project deliveries. Therefore, IT service providers are supposed to execute the projects on fast pace and keep the commitment. But however, the project managers do not get sufficient time to put together all the quality processes and execute checklist to guarantee the expected quality. The project managers in the case company are following the light weighted quality checklist to cover the project daily needs:

- Follow the definition of done tasks
- Tasks status report using e.g.: burn down chart in Jira tool
- Daily standup meeting with project team
- Weekly sync-up meeting with project stakeholders
- Carry out streamline quality activities and measurement

Yet another significant challenge in IT project management is insufficient governance on quality processes and project model. Many of the IT companies used to follow quality processes and project methodologies but however, there is no sufficient governance. Hence, this situation leads to follow inconsistent processes by different PMO groups and Deming's quality life cycle (Plan $\rightarrow$ DO $\rightarrow$ Act $\rightarrow$ Check) is not executed properly.

Moreover, most of the IT companies struggle to analyze the deviation from planning to implementation phase which include aspects such as quality through traditional project management techniques. Lately, IT companies are adapting new technique called Balanced Scorecard (BSC) from the area of management to organization for enhancing the M&C project. BSC main responsibility and function to detect changes in the market to give rise to organizational changes. This technique is accepted world-wide and many IT companies are adapting this technique. It gives 360-view of four

main perspectives and easily analyze the deviation such as financial perspective, customer perspective, internal processes perspective and learning & growth perspective. The details of each perspective are explained in previous Chapter 4.

5.2   Practical Implication

The research revealed many aspects and suggestions to improve quality in IT project management. The results are beneficial for the case company and similar types of IT organizations those dealt in project management. In addition, the results can be compared with prior organization researches and similar studies. The following are the listed suggestions for main quality improvement findings in the project management:

Organizational point of view

- Focus on building knowledge in the area of project and quality management through internal or external trainings and certifications
- Focus on quality measurement standard tools such as Balanced Scorecard, Earned Value Management or Total Quality Management
- Establish centralize PMO to define the processes, models, practices and guidelines to be followed by other PMO groups

PMO responsibilities

- Ensure appropriate project management methodology and processes are defined and followed by project managers
- Continuous improvements in the processes and retrospectives in timely manner
- Quality and risks management is adapted and design aspects are carried out
- Timely data collection during the project
- Ensure customer is involved during the project
- Focus on communication if the project is handling in distributed locations

Development team core practices

- Design pattern is followed and inception phase is taken place before actual development
- Desired unit tests are covered before deployment
- Timely data is provided or logged on tracking tools
- Internal weekly meeting to suggest future improvements

- Follow definition of done tasks

Quality Analyst aspects

- Involve in solution design phase to cover all the aspects
- Testing plan covers necessary functional, 3rd party integrations and performance test cases
- Automatic testing framework to be considered (if needed) to avoid manual testing for longer period

5.3 Comparing the Results with earlier Literature

The empirical study in the research confirms that there is a definitely need for project managers to have good practical knowledge in the body of project management and flexibility in the project management processes, in order to adapt the constantly emerging challenges and opportunities. Lately, the IT companies are changing from a hierarchical approach to project based approach to become more collaborative and knowledge oriented. At the same time, IT companies are moving away from in-house development to outsourcing model and focusing on core business processes and research and development to gain competitive advantages in the global market. This finding is in-line with information obtained during literature review. (Fernandez, & Fernandez 2009, 10.)

The choice of project management methodology is determined as critical concern in the project management according to the empirical study of the research. In addition, the earlier literatures and previous surveys confirmed that without appropriate project methodology, most of the projects compromise with quality or delay in the project delivery schedule. On the other hand, project based companies are already adapting project management methodology but however most of them just follow the standard methodology without understanding whether it is perfectly fit for their needs. Eventually this require deep knowledge in the area of project management or practitioner role to customize the project management methodology based on project needs through adapting best processes and practices from several standard methodologies.

Earlier literatures also confirmed that risk management is another important process in the project management. Some of the project methodology such as agile methodology

already supports inbuilt risk management methods but still there is a definitely need for explicit methods of risk management for improving the quality and delivery of the projects (Walczak, & Kuchta 2013, 75). The same result is obtained from empirical study of the research. Moreover, there will be a possibility to streamline the risk management processes and adapt what is necessary based on the project needs.

Monitoring and control is yet another powerful and critical process in the project management. The success rate of the projects is heavily depending on what level of M&C was considered. Project monitoring covers several possible issues related to schedule, cost, resources, risks and quality as well. Furthermore, it is more organization choice which M&C approach they follow such as perspective or adaptive approach. The prescriptive approach focuses on the formal qualities of the project organization, including documentation, processes and procedures. The adaptive approach focuses on the processes of developing and improving a project organization, project culture and team commitment (Rolstadås, Tommelein, Schiefloe, & Ballard 2014, 638).

The empirical study of the research is also concluded that it is impossible to produce universal list of quality checklist because it varies from one project to another. New dimensions are adopted to enhance monitoring and control in the project such as management process quality and meeting stakeholder expectations. This finding is in-line with previous literatures and researches in the same area. Moreover, monitoring and control is a project management process commonly referred by all the body of knowledge in project management and it represents important processes within their standards.

5.4 Limitations

The material related to the project management and quality management used in the research was easily accessible from different public sources such as google scholar article search tools, project management institution official sites, prior researches in same field. In addition, researcher had accessed to the case company internal project management documentation and easy to organize interviews in the case company in the field of project quality management. However, in many researches access to data or interviewing experts become limitations.

This research was concentrated to study only one of the large operational account in the case company which is operated from Europe and some activities carried out from India. However, the case company has few other small & medium operational accounts and product department which are operated from different geographical areas. Perhaps, this could be considered as one of the major limitation of the research because the obtained results cannot be generalized in cross case studies. Within the case company other PMO groups were following different project methodologies, model and quality milestones/checklists depending on their daily needs. Therefore, it is important to bring into notice that there was no intention to provide such generalizability in the research. The research was aimed to be relevant to IT project managers in the case company and can be utilized in some extent by project management practitioners in similar type of IT companies.

5.5   Recommendations for Future Research

The research gives an overview of the project quality management for IT companies, both the challenges and quality improvement suggestions in the project management. The research includes the practical implications from different point of views such as – organizational to core development team aspects based on collected empirical data through interviews and documentation. However, it is a known fact that this topic has widely researched in recent decade by different organizations and collaboration with many institutions in the area of project and quality management. The reason of increasing research on this topic is because of continuous demand from the customer to provide high level of agility in the project management processes. In addition, the organizations are moving away from traditional approach to project-based approach for improving the operational effectiveness and gaining the competitive advantage in the global market.

For future researches, the current research phenomenon offers many interesting possibilities to continue further. Firstly, the research shed a light on BSC and indicated that few companies are trying and testing the fundamental and concepts of BSC on small scale. The feedback has received quite positive from the companies because of it gives holistic-view of four main perspectives such as financial perspective, customer perspective, internal processes perspective and learning & growth perspective. On the other hand, the companies consider that using BSC on full scale might bring lot of bureaucracy in the processes and governances and it

eventually might generate internal cost for the company. Certainly, there has not been so much research on this topic that what all the advantages and disadvantages of using BSC on full scale in the IT organizations.

Secondly, establish a centralize company-wide PMO to define the project management processes, practices, governances and templates for improving the overall quality in the project management. Of-course if the company is managing several projects parallel then they might think to have several PMOs depending on different business units and accounts. However, the individual PMOs must follow the same processes and practices those are defined on company-wide, and additionally individual accounts can customize PMO based on their daily needs. According to KPMG (2017) survey, 61% respondents said PMO improves governance, 56% respondents said PMO prioritize investment, align and adjust to business strategy and 41% respondent said PMO enables consistency of delivery. Moreover, there is a 4% drop in PMO acceptance (compare to previous year) according to KPMG survey therefore it is important to research this topic further to understand the practical implications and challenges.

Furthermore, it is important to bring in your notice that most of the IT businesses are outsourced who are specialist in specific technologies or functional domain and located to different geographical area. It is a challenge how to collaborate and follow the similar project management processes for making the consistency and synergy in the way of working. Most of the quality issues are pop-up due to lack of communication or inconsistency in the processes. This topic could be interesting to research further, what could be possible project quality issues in outsourcing IT businesses.

REFERENCES

Aarseth, W., Rolstadas, A., Andersen, B. 2013. Managing organizational challenges in global projects. *International Journal of Managing projects in Business, 7*, 103–132.

Albrecht, K. 1995. *Service quality*. Accessed on 01 April 2016. Retrieved from http://www.qualitydigest.com/sep/albrecht.html

Aston, B. 2017. 9 Project Management Methodologies Made Simple: The Complete Guide for Project Managers. Accessed on 10 May 2017. Retrieved from http://www.thedigitalprojectmanager.com/project-management-methodologies-made-simple/

Atkinson, R. 1999. Project management: cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria. *International Journal of project Management, 6*, 337-342.

Balanced Scorecard Basics. 2000. Balanced Scorecard Institute. Accessed on 15 May 2017. Retrieved from http://www.balancedscorecard.org/BSC-Basics/About-the-Balanced-Scorecard

Basic Concepts of Earned Value Management (EVM). 2012. Humphreys Associates. Accessed on 05 May 2017. Retrieved from https://www.humphreys-assoc.com/evms/basic-concepts-earned-value-management-evm-ta-a-74.html

Bloch, M., Blumberg, S., Laartz, J. 2012. *Delivering large-scale IT projects on time, on budget and on value.* Study by Mckinsey & Company. Accessed on 6 December 2016. Retrieved from

http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/delivering-large-scale-it-projects-on-time-on-budget-and-on-value

Bower, D. C., Finegan, A. D. 2009. New approaches in project performance evaluation techniques. *International Journal of Managing projects in Business, 2*, 435–444.

Brink, H. 1993. Validity and Reliability in Qualitative Research. *Curationis*, 16, 35-38.

Charmaz, K. 1983. The Grounded Theory Method: An Explication and Interpretation in Emerson, R. M. Contemporary Field Research: A Collection of Readings. Boston: Little, Brown and Company.

Coyle, S., Conboy, K. 2009. A case study of risk management in agile systems development. Accessed on 1 May 2016. Retrieved from https://aran.library.nuigalway.ie/bitstream/handle/10379/1392/ECIS_Riskmanagement.pdf?sequence=1&isAllowed=y

Cronin Jr, J.J., Taylor, S.A. 1992. Measuring service quality: a reexamination Extension. *Journal of Marketing, 56*, 55-68.

Crosby, P. B. 1984. *Quality without tears*. Accessed on 10 April 2016. Retrieved from http://vasthead.com/Articles/quality_wo_tears.html

Dawson, C. 2009. Introduction to Research Methods. 4th edition. Oxford: How to Books Ltd.

Deming, W. E. 1986. Out of the Crisis [Cambridge, Mass.: Massachusetts Institute for Technology, Center for Advanced Engineering Study]. Accessed on 15 April 2016. Retrieved from http://www.skymark.com/resources/leaders/deming.asp

Elahi, E. 2013. Risk management: the next source of competitive advantage. *Foresight, 15*, 117–131.

Erdogmus, H. 2011. Tracking Progress through earned value. *IEEE Computer Society, 27*, 2-7.

Eriksson, P., Kovalainen, A. 2008. Qualitative Methods in Business Research. Thousand Oaks, California: Sage.

Fernandez, D. J., Fernandez, J. D. 2008. agile project management – Agilism versus traditional approaches. *Journal of Computer Information Systems, 49*, 10-17.

Flyvbjerg, B., Budzier, A. 2011. *Why your IT project may be riskier than you think*. Harvard Business Review. Accessed on 5 December 2016. Retrieved from https://hbr.org/2011/09/why-your-it-project-may-be-riskier-than-you-think

Golafshani, N. 2003. Understanding Reliability and Validity in Qualitative Research. *The Qualitative Report, 8*, 597-606. Retrieved from http://nsuworks.nova.edu/tqr/vol8/iss4/6/

Gorshkova, E. 2011. Improving project management capability with assistance of PMO in a technology company. *Master Thesis of Chalmers University of Sweden*

Goswami, S. 2015. Role of quality management System in project Completion. *Pipeline and Gas Journal, 242*, 64-64.

Grönroos, C. 2007. *Service management and Marketing: Customer management in Service Competition*. John Wiley & Sons, 3rd ed.

Heldman, K. 2005. *projects Manager's Spotlight on Risk management*. Accessed on 1 June 2016. Retrieved from http://www.haaga-helia.fi/en

Holtsnider, B. & Jaffe, B. 2012. *IT Manager's Handbook: Getting your new job done*. 3rd ed.

IBM survey. 2008. PDF document on IBM company's website. Accessed on 5 December 2016. Retrieved from https://www-07.ibm.com/au/pdf/making_change_work.pdf

Kendrick, T. 2009. *Identifying and Managing Project Risk: Essential Tools for Failure proofing Your project*. 2nd ed. [E-books. URL: http://www.haaga-helia.fi/en.Accessed on 10.07.2016]

Köster, K. 2010. International project management. SAGE publications. London.

Law, M., Stewart, D., Letts, L., Pollock, N., Bosch, J., & Westmorland, M. 1998. Guidelines for Critical Review of Qualitative Studies.

Lewis, R. 1991. quality management for projects and programs, project management institute. Accessed on 10 April 2016. Retrieved from http://www.petronet.ir/documents/10180/2323250/quality_management_for_projects

Liberatore, M. J., Johnson, B. 2013. Improving project management Decision Making by Modeling quality, Time, and Cost Continuously. *Journal of Transactions on Engineering management, 60*, 518-528

Marchewka, J. T. 2013. *Information Technology project management*. John & Sons, Inc. Hoboken. 4th ed.

Masters. B., Frazier. G. V. 2007. project quality activities and Goal Setting in project Performance Assessment. *Journal of the quality management, 14,* 25.

Maylor, H. 2003. project management. Ashford Colour. London. 3rd ed.

Mieritz, L. 2012. *Gartner survey shows why projects fail.* Accessed on 6 December 2016. Retrieved from https://thisiswhatgoodlookslike.com/2012/06/10/gartner-survey-shows-why-projects-fail/

Montes-Guerra. M. I., Gimena. F. N., Pérez-Ezcurdia. M. A., Díez-Silva. H. M. 2013. The influence of Monitoring and Control on project management Success. *International Journal of Construction project management, 6*, 164–180.

NDIA. 1998. Earned Value Management System (Standard), American National Standard Institute/Electronic Industry Association, Washington, DC. ANSI/EIA-748 Guide.

Newell, M., Grashina, M. 2004. The project management Question and Answer Book. AMACOM Books. New York.

Noble, H., Smith, J. (2015). Issues of validity and reliability in qualitative research. Evidence-Based Nursing, 18(2), 34-5.

Olsson, R. 2008. Risk management in a multi-project environment. *International Journal of quality & Reliability management, 25*, 60–71.

Papadopoulos, G. 2015. Moving from traditional to agile software development methodologies also on large, distributed projects. *Social and Behavioral Science, 175*, 455-463

Parasuraman, A., Zeithaml V.A., Berry L.L. 1985. A conceptual model of service quality and its implications for future research. *Journal of Marketing, 49*, 41-50.

Parasuraman, A., Zeithaml V.A., Berry L.L. 1988. SERVQUAL: a multiple item scale for measuring consumer perceptions of service quality. *Journal of Retailing, 64,* 14-40.

PMI pulse of the profession survey. 2015. PDF document on PMI website. Accessed on 5 December 2016. Retrieved from http://www.pmi.org/-/media/pmi/documents/public/pdf/learning/thought-leadership/pulse/pulse-of-the-profession-2015.pdf

Porter, M.E. 1985. Competitive Advantage, The Free Press, New York, NY.
Porter, M. Solvell, O. 2011. Finland and Nokia: Creating the World's Most Competitive Economy. Harvard Business School 9, 702-427.

Project Management Process Guidelines Flow Chart. 2013. Accessed on 10 July 2017. Retrieved from http://www.itplanning.org.vt.edu/pm/processflow.html

Project Management Survey (KPMG). 2017. PDF document on KPMG website. Accessed on 2 August 2017. Retrieved from https://home.kpmg.com/content/dam/kpmg/nz/pdf/01816%20PMS%20ReportCompressed.pdf

Project Risk management tools and Technique. N.d. Accessed on 10 July 2016.

Retrieved from http://www.projectmanagementguru.com/risk.html

Raby, M. 2000. project management via Earned Value. *Work Study, 49*, 6–10.

Rawsthorne, D. N.d. Calculating Earned Business Value for an agile project. Accessed on 12 July 2016. Retrieved from https://cs.anu.edu.au/courses/comp3120/public_docs/CollabNet_WP_Earned_Business_Value_041910.pdf

 Rolstadås. A., Tommelein. I., Schiefloe. P. M., Ballard. G. 2014. Understanding project success through analysis of project management approach. *International Journal of Managing projects in Business, 7*, 638–660.

Saunders, M., Lewis, P. & Thornhill, A. 2009. Research Methods for Business Students. 5th edition. Harlow: Prentice Hall.

Shalloway, Beaver, Trott. N.d. The Role of quality Assurance in Lean-agile Software Development. Accessed on 1 July 2016. Retrieved from http://www.netobjectives.com/files/books/lasd/role-quality-assurance-lean-agile-software-development.pdf

Strauss, A., Corbin, J. 1998. Basics of Qualitative Research: Grounded Theory, Procedures and Techniques. 2nd edition. London: SAGE Publications Ltd.

Sulaiman, T., Smits, H. 2007. Measuring Integrated Progress on agile Software Development projects. Accessed on 1 July 2016. Retrieved from http://www.methodsandtools.com/archive/archive.php?id=61

Talent Tampere - News, https://talenttampere.fi/talents/aiber-networks-builds-a-high-security-data-center-to-tampere-finland. Accessed on 25.3.2017

The Standish (Chaos) group report. 2015. PDF document on projectsmart website. Accessed on 5 December 2016. Retrieved from https://www.projectsmart.co.uk/white-papers/chaos-report.pdf

Tomasetti, R., Cohe, S., Buchholz, M. 2005. Earned Value management. Accessed on 5 July 2016. Retrieved from https://www.asigovernment.com/documents/adv05-08.pdf

Wanderley, M., Menezes, J., Gusmao, C., Lima, F. 2015. Proposal of risk management metrics for multiple project software development. *Computer Science, 64*, 1001-1009.

Walczak, W., Kuchta, D. 2013. Risk characteristics of agile project management

methodologies and responses to them. Operations Research and Decisions.

What is project quality management? N.d. Accessed on 17.05.2017. Retrieved from Aims Grow Your Career official website www.aims.education

Wrike survey on project management. 2015. Page on Wrike's website. Accessed on 5 December 2016. Retrieved from

https://www.wrike.com/blog/complete-collection-project-management-statistics-2015/

Zeng, S.X., Lou, G.X., Tam, W.Y. 2007. Managing information flows for quality improvement of projects. *Journal of Measuring Business Excellence, 11*, 30–40.

APPENDICES

Appendix 1. Questions for the Interview (Individual)

Interviewee: Quality Analyst (Test Manager) in the case company from Customer

Operations team

Thursday 16 February 2017 at 2:00 p.m. Time: 52 minutes.

Quality processes	Project processes	Questions
Quality planning	Project initiation	Q1: How do you define different risks (quality, schedule or cost) in project testing? What is most important: schedule, cost or quality?
		Q2: How do you evaluate; what level of testing is needed in a project to accomplish the customer requirements?
	Project planning	Q3: How is the end customer involved in tests planning and verification?
		Q4: How do you estimate the effort needed for project testing? Is there any formula that can be used for any type of project?
Quality assurance	Project execution	Q5: What type of quality tools do you use for quality assurance in testing? Or do you use any of the 7QA tools?
		Q6: Why do you choose automate testing over manual testing? How does automate testing influence quality of the project delivery? What percentage of automated tests do you include in the testing planning?
		Q7: How do you assure quality of fast track projects in tests planning over normal projects? Is there any different quality checklist or processes to manage fast track projects?
Quality control	Project monitoring & control	Q8: What kind of quality control processes do you use in tests planning?
		Q9: How do you manage the blocker defects those are found during testing? How do you track them and what is the reporting process?
	Project closing	Q10: Do you prepare any document with test cases and result report to measure the quality?

General	Q11: What kind of communication do you use to interact with project teams? Do you believe good communication improve project quality? Q12: Do you see a risk on project delivery schedule if the project teams are located in distributed locations? How do you coordinate with project teams?

Appendix 2. Questions for the Interview (Group)

Interviewees: Three project managers in the case company from Customer

Operations team

Thursday 15 March 2017 at 2:00 p.m. Time: 63 minutes.

Set 2: Questions for Project Managers		
Quality processes	**Project processes**	**Questions**
Quality planning	Project initiation	Q1: How do you evaluate/categorize different risks (quality, schedule or cost) in a project? What is most important in project management point of view: schedule, cost or quality?
		Q2: What type of quality processes do you use in project management? Do you think, quality processes can help to identify the risks in project delivery schedule?
	Project planning	Q3: How do you manage the risks in project management? Do you use any kind of risk management tool? Do you prepare a risk register during project and is it easily accessible by PMO?
		Q4: Do you see a risk in project delivery schedule if the project teams are located in distributed locations? How do you coordinate with project teams?
Quality assurance	Project execution	Q5: How do you prepare project execution plan? What is your main focus area while making project execution plan?
		Q6: What type of quality tools do you use for quality assurance?
		Q7: How do you assure quality of fast track projects over normal projects? Is there any different quality checklist or processes to manage fast track projects?
Quality control	Project monitoring & control	Q8: What kind of monitoring and control processes or tools, do you use in project management?
		Q9: How do you track the project progress? How do you communicate to stakeholders if there is a risk in the project schedule?

	Project closing	Q10: How do you analyze the total earned value in project management? Do you use any kind of EVM tool?
	General	Q11: What type of project model and methodology do you use in project management? What type of criteria do you use to choose right methodology? Do you see quality improvement in project management while choosing right methodology? Q12: What kind of communication do you use to interact with project teams? Do you believe good communication improve project quality?