

**Do Project management competencies influence the project performance?**  
**An Insight at Philips Healthcare**

Thesis Report  
MST-80433 (MSc Thesis Management Studies- 33 ECTS)

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September 2017



## **Abstract**

Project management is playing an important role in changing business landscapes. The purpose of project management is to help in the design and development of a project and bring about structure in the execution of a project. Project managers are important stakeholders who set expectations for the project and drive the project. In order to set expectations for the project, the project manager needs to be well equipped to come to a common understanding with all the stakeholders involved and also agree on the scope of the project. Hence, the need for competencies for project managers. Competencies encompass behavioural and cognitive attributes also called as hard and soft skills respectively. These competencies are important to drive project success. Thus, this study aims to improve project performance by investigating the influence of project management competencies on the KPIs of project performance. An empirical research was conducted at Philips and the research units investigated were the project managers in the markets of India and China. These markets were chosen as they generated a lot of revenue and the number of project managers were large in number. The empirical results revealed a significant relationship between hard skill-scope management and soft skill-negotiation. The results also showed a significant relationship between hard skill-human resource management and soft skill-team building. However, there was no significant relationship between both hard and soft skills and the KPIs based on cost, time and quality. Regression analysis was also conducted with KPIs based on cost, time and quality as the dependent variables and hard and soft skills as the independent variables. The results showed that the regression model for this relationship was not significant due to soft and hard skill showing high multicollinearity due to significant correlation between the hard and soft skill.

*Keywords:* project management, competencies, hard skills, soft skills, KPIs, project performance

## **Management Summary**

**Research objective** – The purpose of this study is to improve project performance of project managers by investigating the influence of project management competencies on the KPIs of project performance.

**Research Design** – An empirical research was conducted at Royal Philips in the Netherlands and the research units that were investigated were project managers in India and China. These markets were selected because they are large markets in terms of revenue and number of Customer Project Managers (CPMs). Literature review was done and included topics like competencies, hard skills, soft skills and KPIs. Interviews were conducted with project managers from the central team based on the literature study in order to derive the conceptual framework. The research consisted of a questionnaire that was used to assess the CPMs in the market of India and China and the survey was sent via email. Spearman's rho correlation coefficient and regression analysis was used to analyse the hypotheses derived based on literature. Additionally, control variables years of experience and certification status were used to find how much variance they explained next to hard and soft skills.

**Findings** - The study entailed a strong positive relationship between hard and soft skills. There was a positive relationship between scope management and negotiation and also between human resource management and team building. However, there was no significant relationship between both skills and the KPIs of project performance. The study also found the influence of 2 variables- years of experience and certification status on hard and soft skills.

**Implications for project managers** - The project managers at Philips should not only focus on the hard skills but also focus on the soft skills. They should look at developing more soft skills through training and development. As we identify from this study, that hard and soft skills have a significant relationship and hence are equally important for the project manager to be successful.

**Limitation**- One limitation of this study include the low number of CPMs (60) considered for the research which may hamper the generalizability of the results outside this study. The second limitation of the study was that the CPMs could not be interviewed to find their views on the assessment as well as the competencies assessed. Other limitations of the study are mentioned in the limitation of research sub section.

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### **List of Abbreviations**

CPM- Customer project manager

KPI- Key Performance Indicator

HRM- Human Resource Management

PMBOK- Project Management Book of Knowledge

NGO- Non-governmental organizations

PMP- Project management professional

ERP- Enterprise Resource planning

## 1. Introduction

Project management is playing an important role in changing business landscapes (Webster, 1993). The purpose of project management, is to bring about structure in the execution of a project. A project is used to create a unique service, product or result (Snyder, 2014). The project as a whole, has its own objectives, measurable criteria and a defined cost and time. Due to the limited timeframe for a project, the scope and resources available are also limited. The time required to complete a project also becomes important. The more time the project takes to complete, the more complex it becomes, raising the risk of failure (Snyder, 2014). There is a vast increase in the application of project management in organizations from 2002 to 2011 (Fortune, White, Jugdev, & Walker, 2011).

The importance of project management as one of the main activity in projects in organizations, was identified much before the 2000s (Shrnhur, Levy, & Dvir, 1997). "Project Management is a discipline that applies concepts, techniques, tools and rules to meet project requirements" (Snyder, 2014). Project management typically consists of 5 phases, namely initiation, planning, implementation, closing, and monitoring & controlling (Snyder, 2014). The stakeholders of a project are those people that are impacted by and/or impact the project. The stakeholders in a project cover a wide range of people that includes the client, sponsor, project manager and also people from quality control and quality assurance (Snyder, 2014).

The project manager is the person who drives the project and sets the expectations of the stakeholders involved in the project. It is the prerogative of the project manager to set the standards of cost, time and quality for a project (R Ireland, 1992). Each project manager adopts a unique management and working style. However, the management and working style of the project manager also depend on the industry in which the project manager is operating (R Ireland, 1992). Finally, the working style adopted by the project manager in a project depends also on the competencies of the project manager (Chipulu, Neoh, Ojiako, & Williams, 2013).

Competencies are often studied by individual attributes, like skills, knowledge and attitudes, that perform tasks (Rainsbury, Hodges, Burchell, & Lay, 2002). The individual attributes can broadly be classified as cognitive and behavioural attributes. The cognitive attributes include technical skills that usually includes technical knowledge and expertise. Behavioural attributes include not only personal characteristics that describe how one handles a situation, but also interpersonal skills that describe how relationships are handled, and organizational skills that describe how to secure organizational outcomes through



organizational networks (Rainsbury et al., 2002). Skills are hence considered one of the important attributes of competencies.

There is the need for both hard skills and soft skills in organizations (AIPM, 2008; Association & Caupin, 2006; Snyder, 2014). 'Top managers' are usually recognized for their ability to showcase both technical and personal skills (Rainsbury et al., 2002). Hard skills are cognitive attributes of competencies, as these skills involve knowing technical aspects to perform a job. Soft skills on the other hand, are behavioural attributes of competency and includes personal behaviour and managing relationships with people (Rainsbury et al., 2002). The dichotomy between the two skills are often used to describe the different dimensions of a project like methodologies, systems, approaches, measures, costs and situations and sometimes used to create a framework. The two skills also have a link to project success (Crawford & Pollack, 2004). A project is determined a success, when the project has - an impact on the customer involved in the project, efficiency in completing the project and impact on the stakeholders. Project success also has a positive statistical influence on project performance and more specifically project management Key performance indicators (KPIs) (Mir & Pinnington, 2014). This link between skills and project performance and specifically project management KPIs needs to be exploited.

Competencies often help in project performance, but competencies are seldom used as leading indicators to track the project performance (Fayek & Omar, 2016). Project performance has been usually evaluated using numerous metrics like cost performance, quality performance and schedule performance (Yun, Choi, de Oliveira, & Mulva, 2016). KPIs are a set of measurable data for evaluating and measuring the performance of the project manager (Kerzner, 2013; Wasioyo, 2010). A KPI can be either leading or lagging. Leading KPIs are used to measure and track performance before a problem arises in performance, whereas lagging KPIs are used to measure and track performance after a problem arises (Orlowski, Blessner, Blackburn, & Olson, 2015). To identify the critical outcomes at a project level, there is a need at Philips for an adequate measurement system for project managers and stakeholders involved in a project (Cox, Issa, & Ahrens, 2003).

### 1.1 Background of company and problems faced by project managers

Philips is one of the world-renowned companies headquartered in the Netherlands. Philips, from the year 2016 has started operating as two separate entities - Philips Lighting and Royal Philips. From here on we refer merely to Royal Philips, the healthcare focused company, when we use the word Philips. The mission of Philips is to improve people's lives by innovating, to build a more sustainable and healthier world. The vision of the company is to improve the lives of people through innovation (Philips, 2017).

The Customer Project Managers (CPMs) at Philips face complex problems when delivering health systems to their customers. The main role of the project managers is to manage the triple constraints - cost, time and quality. Each constraint is set at the start of the project, but they may be adjusted throughout the project execution. A change of the cost, time or quality constraint may influence the project. The main responsibility of the project manager is to optimally manage the cost, time and quality and deliver the health system to the customers (Philips, 2017)



Fig .1: Process Framework for a project at Philips

Source: Philips, 2017

In Fig. 1, the process framework shows the different processes in most projects at Philips, in a typical order for a health system project at Philips. Specialists complete the processes mentioned in the process framework. The first stage is the pre-sales support, where technical feasibility and an estimate of the project is drawn. The second stage is quote preparation, where a site layout proposal is made with the actual costs. In the third stage, sales handover is done after the order is confirmed and then the project is handed over to the project manager. Until the third stage of the sales handover, the account manager of a hospital or a medical institute is involved. The fourth stage of the project is project planning, where the project manager agrees on the scope of work and in the fifth stage, the site readiness for the health system to be installed is checked. Further in the sixth stage, the medical equipment is distributed to the site of the hospital or medical institute. In the seventh stage, the lead installer of the system installs the equipment at the hospital or medical institute. The eighth stage involves the application specialist, who trains personnel on the purchased health system application. Finally, in the ninth stage, the system is handed over to the customer and the project is transferred to Philips customer service. Additionally, monitoring and controlling are done throughout the project. The project manager is involved in all the aforementioned processes (Philips, 2017). Therefore, it is important for the project manager to have the competencies to deal with such specialists by not only having knowledge on all these areas but also managing the specialists.

From section 1 and sub section 1.1 we understand that there is a gap in knowledge in literature between the relationships between project management competencies and project performance and the need to improve project management competencies of the CPMs in Philips respectively. Hence, this gap in knowledge is addressed in this research study.

## 1.2 Problem Statement

Philips is ever changing and faces many complex problems. The company is present in 17 markets that include Benelux, India, China, Japan, Russia, CEE (Central and Eastern Europe), France, APAC (Asian Pacific), Latin America, North America, Middle East, Africa, DACH (Germany, Austria and Switzerland), Iberia, Nordic, UK and Ireland and IIG (Italy, Israel and Greece). Philips faces the need to develop and strengthen competencies (more in particular, hard and soft skills) for its CPMs to improve cost, time and quality of projects. To improve project performance, Philips would like to find the relationships between the competencies of CPMs and project performance.

## 1.3. Research Objective

The objective of this research is to improve project performance of project managers by investigating the influence of project management competencies on KPIs of project performance.

## 1.4 Main Research Questions

What are the relationships between project management competencies and KPIs of project performance?

## 1.5 Sub-Research Questions

1. What are the hard skills that are required by a project manager?
2. What are the soft skills that are required by a project manager?
3. What KPIs are used to measure the project performance?
4. How are the KPIs influenced by the hard skills of a project manager?
5. How are the KPIs influenced by the soft skills of a project managers?

There are 5 sub-research questions (SRQ) to be answered at the end of this research study. SRQ 1, 2 and 3 are used to find literature on hard skill, soft skills and KPIs. At the end of the literature review, expert

interviews are conducted with experienced project managers in the Netherlands, in order to restrict this list further to arrive at the relevant hard skills and soft skills. The interviews might also be used to identify the hard and soft skills that are not present in literature but important for project managers at Philips. A conceptual framework is then formulated. SRQ 4 and 5 are used to derive the relationships between hard skills and KPIs and soft skills and KPIs respectively. The first 3 SRQ's are used to find literature and will be dealt with in the literature review chapter and the SRQ 4 and 5 are empirical studies and will be dealt in the result chapter.

## 2. Literature Review

A brief overview of the competencies and project manager's qualities is described first. Next, hard and soft skills are described. The review also touches upon the different types of KPIs that are used to track the performance of project managers. Later, a conceptual framework is derived from the literature review. This literature review will help in understanding the relationships between hard skills, soft skills and KPIs.

### 2.1 Competencies

Competencies is defined as the "ability to mobilise, integrate and transfer knowledge, skills and resources to reach or surpass the configured performance in work assignments, adding economic and social value to the organization and the individual" (Takey & Carvalho, 2015). There are three conceptualisations for competencies. The conceptualisations are generic, behaviouristic and holistic. The generic conceptualisation indicates the personal qualities of a person. The person is differentiated from another because of these personal qualities and hence is a standout performer. The behaviouristic conceptualisation deals with the external behaviour of the person and not on the input the person provides (Biemans, Nieuwenhuis, Poell, Mulder, & Wesselink, 2004; Sandberg, 2000). The holistic conceptualisation, defines competence as an integrated approach that includes performance as well as qualities to describe a person in an organization. There are two dimensions to holistic approach. The first dimension involves significant qualities like knowledge, skills and attitudes and the second dimension entails an overall purpose to the organization (Wesselink, Blok, van Leur, Lans, & Dentoni, 2015).

The competency of an individual in an organization has become a very powerful tool in modern human resource management (HRM) (Collins, 1997). The learning processes and performance are often communicated through competencies in organizations these in recent days. Competencies have a wide range of uses that includes training and development, selection of candidates, performance management, motivation and rewarding (Mulder, 2001). The performance and the job roles are clearly defined based on the competency of an individual, so that the human resource can function more efficiently. This literature review will hence focus on a more holistic approach as described by (Wesselink et al., 2015).

### 2.2 Project Manager Qualities

The project manager is the person, who sets the expectations for a project. The project manager sets the tone in terms of cost, quality and time and makes sure they are not totally conflicted. Often, the project manager is the person blamed when various dissatisfaction arises amongst team members and customers,

irrespective of industry (R Ireland, 1992). Some common sources of dissatisfaction include keeping opinions to themselves, being abrasive, refusing to accept recommendations of others and unable to set a good example for peers. In order to counter the dissatisfaction in most industries, project managers adopt the following rules. The first rule is that project managers establish a good relationship and trust with customers. The second rule is to understand the underlying problem of the customer, try to address it and decide the scope of it. The third rule is to learn to lose an argument and the fourth rule is to develop a visible interpersonal relationship with the customer (R Ireland, 1992).

Competencies and behaviours help shape the project manager and transform into a more 'people manager'. Project managers are effective when they have good communication with the project team and stakeholders, inspire other project members, express integrity and empathize with people (Fisher, 2011). Honesty and integrity are two important characteristics, that define a project manager in order to win the trust of project stakeholders and also maintain long-term relationships with the project team. The project manager needs to be smart enough, in order to know the strengths and weaknesses of the project members, put them in the right role in a project and make full use of their potential. This is also referred to as the authentizotic behaviour (Fisher, 2011).

With respect to cultural barriers that project managers face, Trompenaars and Hampden-Turner (1997) talks about how the project managers need to adapt to the different working cultures. In their study, they identify the differences in the working style that exists in the western and the eastern part of the world. The need for project managers to know what works in one culture and what doesn't, is important. To manage people with an international scope, project managers need to understand different traditions and trends to be successful. As more companies are beginning to operate on a global scale, adapting to cultures has become an important characteristic for any project manager, irrespective of the industry (Trompenaars & Hampden-Turner, 1997).

Developing competencies help project managers to keep pace and help adapt to the current market and industry demands (Chipulu et al., 2013). As the years have gone by, the demands for industries have changed rapidly and there is a need for questioning the existing processes and business practices (Hayden Jr, 1996). A major part of the study done by (Starkweather & Stevenson, 2011), included project managers from the health services industry, and the project managers were preferred to have specific competencies for specific projects. As a contrast, in the Healthcare Leadership Alliance Summit, there were 5 important competencies required by healthcare executives and leaders that include communication and relationship

management, professionalism, leadership, knowledge of the healthcare system and business skills and knowledge. Additional responsibility that were not technical was also required for project managers to be successful (Stefl & Bontempo, 2008). Napier, Keil and Tan (2009) stated the project manager to be the person who possesses all the competencies in order to avoid failure and succeed in a project (Napier, Keil, & Tan, 2009).

We can see from sub section 2.1 and 2.2, what are competencies, why competencies are important in an organization and how the project manager benefits from having such competencies. Next, we see the behavioural and cognitive attributes of competencies and an extensive literature study is done on these aspects from sub section 2.3.

### 2.3 Hard skills

The project management competencies are at the core of business, and are often used as a tool to leverage project success (Isik, Arditi, Dikmen, & Birgonul, 2009). The Project Management Institute (PMI) provide global standards, training and certifications to project managers across the world to engender organizational success and mature the profession of project management (Guide 2004). The Project Management Book of Knowledge (PMBOK) defines 5 important process groups that are important to drive any project. They are initiation, planning, executing, monitoring, controlling and closing (Guide, 2004). The initiation process helps to define a new project or a new phase of the project. The planning process help define the scope of work and define the objectives of the project. This process also encompasses all the tasks that are involved in planning and scheduling. Execution process involves the delivery of the tasks that are decided. Monitoring and controlling process involves reviewing and reporting the outcomes of the project. Closing process involves reflecting on the project outcomes and work on areas for improvement (Guide, 2004). PMI also defined different knowledge areas that are important for the project managers to be successful, irrespective of industry. There are 10 knowledge areas that are defined in the PMBOK. This framework of the 10 knowledge areas was used as a guide to find more literature on hard skills for this research study. The focus of the PMBOK is also more on hard skills and hence was used as a framework for reviewing more literature on hard skills (Guide, 2004). The different studies that identified the different project management hard skills are described below and summarized at the end of this section.

Meredith and Mantel (2011), Forsberg et al., (2000) came up with hard skills that included Project Integration management, Project scope management, Project Time management, Project Quality management, Project Cost management, Project Human resource management, Project Communication

management, Project Risk management, Project Procurement management in their study (Forsberg & H Cotterman, 2000; Meredith & Mantel Jr, 2011). The study described nine important hard skills that were described as part of the PMBOK framework.

According to Chin and Hamid (2015), two hard skills namely cost and time management were identified. In their study, they described how project cost management and project time management are important and how their importance is evident in any project. The practice of time management used 8 types of tools to manage time (Chin & Hamid, 2015).

From the previous study, the importance of time management was identified. Mackenzie (1972) describes the 5 processes that are involved in time management. The 5 processes were time planning, time estimating, time scheduling and time control to allocate time, to each of the process. By doing so, they make sure there are no delays in completing the project on time (MacKenzie, 1972).

Scope management is another important hard skill described in the PMBOK. Scope management involves the activities that manage the scope of an entire project using (Khan, 2006). The author defines the 5 components that encompass the entirety of scope management in a project as project initiation, scope planning, scope definition, scope verification and scope change control (Khan, 2006).

Risk management, another important hard skill from PMBOK was dealt by (Zwikael & Ahn, 2011). Zwikael and Ahn (2011) in their study talk about the importance of risk management for project management. They also describe the need for better risk management planning due to limited variety of tools, poor quality of use, high complexity, low authority of project managers and perceived low effectiveness. The results from the study revealed that risk management is very important in countries with low uncertainty avoidance and industries that exhibit low project management maturity (Zwikael & Ahn, 2011)

Crawford (2005) in his study which was conducted in three countries namely Australia, UK and USA found a number of hard skills essential for project management. They included contract management, time management, cost management, procurement management, human resource management among other competencies. The study also used the hard skills to find the perception of senior management and the result was that there was less significance (Crawford, 2005).



Takey and Carvalho (2015) in their study, used competency mapping of project management competencies in an engineering company. They used 4 categories to map project management competencies that included project management processes, personal, technical and context and business. The project management processes category includes integration, scope, time, costs, quality, human resource, communication, risk, contract and safety and health management. The results also reveal that cost and scope were important with respect to financial planning and schedule planning respectively (Takey & Carvalho, 2015).

According to Isik et al., (2009), there is an effect of corporate strengths and weaknesses on the project management competencies. The project management competencies used for this study include 9 competencies based on the need for three different industries and included competencies like stakeholder, schedule, cost, quality, human resource and risk management (Isik et al., 2009).

Briere, Proulx, Navaro Flores, Laporte (2015) enlisted the different types of competencies for project managers in International NGOs. The technical skills used for their research included a list of 19 competencies. They important competencies were risk and opportunity, quality project organization, scope and deliverables, resources, cost and finance, time and project phases and procurement to name some. They used the project knowledge in specific NGO settings to find perceptions of project management practitioners (Brière, Proulx, Flores, & Laporte, 2015).

Safety and health management was a topic that was not part of the framework of PMBOK but was used as an important competency in many research studies. The study about safety and health management, dealt with reducing the number of accidents, no increase in the cost of insurance and compliance to the regulations. This competency was important for people working in places that were more prone to accidents. Some methods to reduce the number of accidents included training activities, supervision and innovative use of technology (Ringen, Seegal, & England, 1995). The summary of all the hard skills derived from the various authors from literature are described in Table 1.

Table 1: Summary of the hard skills from literature

Hard Skills	Meredith and Mantel (2002); Forsberg et al., (2000)	Chin and Abdul Hamid (2015)	Mackenzie (2013)	Khan (2006)	Crawford (2005)	Takey and Carvalho (2015)	Isik et al., (2009)	Briere et al., (2015)	Zwikael and Ahn (2011)
Scope management	X			X		X		X	
Time management	X	X	X		X	X	X	X	
HR management	X				X	X	X		
Communication management	X					X		X	
Integration management	X					X			
Cost management	X	X			X	X	X	X	
Quality management	X					X	X	X	
Risk Management	X					X	X	X	X
Procurement management	X				X			X	
Stakeholder management						X			
Contract management					X	X	X	X	
Safety and Health management						X	X		
Supply chain management							X		

El-Sabaa<sup>1</sup> (2001) studied the skills that were required for a project manager to be successful in three different industries. The study used human skills, organizational skills and technical skills and the results revealed that human skills was the most important in all three industries. The technical skills included in this study were knowledge of tools and techniques, project knowledge, understanding project processes and technology use (El-Sabaa, 2001).

Starkweather and Stevenson (2011) in their study in the IT industry developed a critical competency index. They used a set of competencies to identify the critical competencies. The authors devised a Hiring Criteria Index using the critical competencies that included technical expertise, education and PMP certification. The results of this study also concluded that soft skills were more preferred over hard skills in the IT industry and the following section will be a literature review of the soft skills concerned with project management competencies (Starkweather & Stevenson, 2011).

There were 13 hard skills that were identified from 9 different authors. Some authors identified more than one hard skill that was important whereas some authors could identify as low as 1 hard skill as important. In order to bring down the number of hard skills to a manageable list, the skills were presented in the form a questionnaire to experts to identify the most important hard skills.

#### 2.4 Soft skills

Soft skills are very important to be successful in industries. Various soft skills have been deemed important in various industries, as having only technical skills are not enough to survive in today's world (Takey & Carvalho, 2015). Edum-Fotwe and McCaffer (2000) in their study, elucidate the "general knowledge and skills" required for a project manager to develop, with respect to the project management competency (Edum-Fotwe & McCaffer, 2000). The authors identify soft skills as primary and secondary. The primary soft skills include managerial skills. The managerial skills that were identified were leadership, delegation, negotiation, decision making, motivation, promotion and team working, time management and top management relations. Secondary skills include financial, legal and communication skills to develop the project management competency (Edum-Fotwe & McCaffer, 2000). The different studies that identified the different soft skills are described below and summarized at the end of this section.

Negotiation is one of the skills highlighted by Edum-Fotwe and McCaffer (2000). Negotiation involves stepping into the shoes of another person that is involved and understanding the expectations of the other person involved and then deciding. The scope determination of the project is also determined and

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<sup>1</sup> There were authors that used general descriptions of project management competencies and hence were also included in this review of literature but were not part of the summary table.

adjusted throughout project execution (Meredith & Mantel Jr, 2011). Scope determination is an important phase in the hard skill scope management. Hence, from the above discussion we arrive at the first hypothesis

*H1: Scope management is influenced by negotiation*

Brill, Bishop and Walker (2006) used a Web-based Delphi survey to find the important soft skills that are required for a project manager to be effective at workplace (Brill, Bishop, & Walker, 2006)). This method used 2 rounds of survey and identified 78 trainable soft skills for the project managers. The authors identified the main soft skills to be problem solving expertise, leadership expertise, emotional intelligence, content knowledge, analytical expertise, people expertise, communication expertise, project administration expertise and tools expertise (Brill et al., 2006).

Emotional intelligence is a soft skill that is often considered vital for project managers. The aspect of emotional intelligence is considered an asset for project managers (Clarke, 2010). The study also revealed that training had an impact on the emotional intelligence of the project managers. Further, usage of emotions, conflict management, teamwork and empathy were used as the variable on which the emotional intelligence of project managers were measured (Clarke, 2010). In another study of emotional intelligence, Dulewicz and Higgs (2003) came up with 15 leadership competencies under the grouping of intellectual, managerial and emotional quotient. The project type was classified as high, medium and low in order to classify the project manager's leadership style and explain how certain leadership styles lead to more project success (Higgs & Dulewicz, 2003). The disparity in the kind of project managers was also determined by their competence to deliver on projects. Boyatzis (1982) in his study found a list of competencies that distinguished the superior, average and poor managers. The competencies accounted for nearly 27% of the effectiveness of a manager. In the 6 set of competencies that were determined, leadership and soft skills were amongst them (Boyatzis, 1982). Pettersen (1991) in his study, also discusses the important project manager characteristics to be effective. The study revealed that the interpersonal skills like communication, team building and leadership were more important than the technological skills to become a good manager. Skills that are important for management were also identified like planning, goal fixing and analysis (Pettersen, 1991).

Rosenau and Githens (2011) talks about the need for project managers to be polite and honest in order to win the confidence of the project team members. The author suggests that a myriad of soft skills like

team building, problem solving and communication skills are important for the project manager to deal with the many problems that they face. Furthermore, it is also suggested that the soft skills are considered most important than hard skills (Rosenau & Githens, 2011). Trust amongst project personnel and stakeholders is another important aspect that inspires project performance (Kadefors, 2004). Trust in this study, is dealt from the point of view of partnering projects and how each of the stakeholders are respected for the expertise they bring to the project (Kadefors, 2004).

Effective project managers used the cultural aspect of dealing with project personnel, inspired them to be part of the organization and made them own the mission of the organization. Alignment of the team's goal and organization goal helps in building a unified organizational culture and team spirit (Fisher, 2011). Fisher (2011) also considers that unbiased nature and recognition of personal milestones of individuals as traits that are important to unify the team behind the organization's mission (Fisher, 2011).

The team members of a project, needs to be selected with care, as they should not be detrimental in the execution of the project. Dainty, Cheng and Moore (2005) in their study developed a predictive model to select and develop human resource in an organization. Self-control and team leadership qualities were defined as the most predictive behaviour of project management within the predictive model. Performance management and recruitment were some of the human resource decisions that were based on the application of this predictive model (Dainty, Cheng, & Moore, 2004).

The team members in a project, need to keep learning and improving to better the project and develop better skills. Edmondson, Bohmer et al., (2001) in his study reiterates the need for the project manager to create an atmosphere of excellent camaraderie and learning to aid learning for oneself and also the members of the team. As project managers, it is imperative for them to be the driving force to enable team learning and also be open to new suggestions (Edmondson, Bohmer, & Pisano, 2001). Lunemann and Wysocki (2008) on the other hand, talks about how project managers need to be creative and inspire the project team in finding new, innovative solutions. The authors also touch upon conflict management while coming up with new solutions and how to control conflicts that arise due to these new solutions, within the team (Lunemann & Wysocki, 2008).

El-Sabaa (2001) in his study points out the important human skills that a project manager requires to be effective. He mentions delegation, communication, enthusiasm, coping with situations, mobilizing

subordinate energy as some important human skills across three industries. He also reveals the difference in the career paths of a project manager and a functional manager (El-Sabaa, 2001).

The management of project ecology and interpersonal relations are important in a project. On an organizational front, risk and uncertainty are affected by soft skills. For example, the organizational culture can play a difference (Carvalho & Rabechini Junior, 2015). Soderlund and Maylor (2012) in their research point out that risk can be often managed by equipping the project team with soft skills(Söderlund & Maylor, 2012).

Stevenson and Starkweather (2011) in their study in the IT industry also found out that practitioners of project management prefer soft skills more to hard skills. They identified 6 project management core competencies that included ability to communicate at all levels, leadership, cultural fit, ability to deal with ambiguity, verbal and written skills and attitude (Starkweather & Stevenson, 2011).

HRM is one hard skill that often uses soft skills to cater to the different processes involved. Ding, Kam et al., 2015 mention 4 HRM practices namely recruitment and selection, training and development, performance management and reward management. This study also elucidates the importance of team building activities (part of training and development) and how these activities positively influence HRM practices (Ding, Kam, Zhang, & Jie, 2015; Starkweather & Stevenson, 2011). Hence, with regards to the above discussion we come to the second hypothesis i.e.

*H2: Human resource management is influenced by team building.*

The summary of all the soft skills derived from the various authors from literature are described in Table 2. The format of Table 2 is slightly different from the Table 1 since the number of soft skills identified were more than 20.

Table 2: Summary of the soft skills from literature<sup>2</sup>

Skill type	Competencies from literature	References used
Soft Skills	Leadership; communication; delegation; decision making; problem solving; negotiation; motivation and promotion; management relationship; content expertise; analytical expertise; people expertise; trust; emotional intelligence; cultural fit; deal with ambiguity; verbal and written skills; attitude; organizational culture; self-control; conflict management; polite; work under pressure; commitment to the organization; development of other	Edum-Fotwe and McCaffer (2000); Brill et al., (2006); Soderlund and Maylor (2012); Stevenson and Starkweather (2010); Carvalho and Rabechini Junior, 2015; Pettersen, 1991; Boyatzis (1982); Dulewicz and Higgs (2003); Dainty et al., 2004; Wysocki (2007); Edondson et al., (2005); Rosenau (1998); Kedefors (2004); Clarke (2010); El-Sabaa (2001)

There were around 24 soft skills that were identified from the literature study. Some soft skills like development of others, polite, verbal and written skills were removed as development of others and leadership had the same meaning and polite and verbal and written skills were considered pre-requisites for any employee and hence removed. The rest of the 21 soft skills had to further reduced to a manageable list and hence the skills were presented in the form a questionnaire to experts to identify the most important soft skills.

## 2.5 Key Performance Indicators (KPIs)

When we focus on the performance of a project, there are different metrics used to measure project performance for different projects. The performance of the supply chain for example, is measured using a balanced scorecard. This serves the purpose of a wholesome performance measurement system of people involved in the supply chain and includes three major perspectives namely: financial, customer and the internal business perspective (Brewer & Speh, 2000). KPIs are often used to measure the three different perspectives of the balanced scorecard. Cox et al., (2003) mentions that KPIs are often used as an indicator to measure the performance of project managers and are project specific (Cox et al., 2003). KPIs are a set of measurable data for evaluating and measuring performance of the project manage(Kerzner, 2013; Wasiyo, 2009). Yeung, Chan, Chan and Li (2007) in their study discusses the Delphi method which is used to measure the KPIs in partnering projects. The KPIs that were identified based on

<sup>2</sup> There were approximately 20-25 soft skill competencies that were identified and hence the setup of the table is slightly different from the previous table and only an overview of all authors and skills identified are mentioned.

this technique were given weights. The identified KPIs were innovation and improvement, effective communications, trust and respect, quality performance, top management commitment, cost performance and time performance in the increasing order of their weights (Yeung, Chan, Chan, & Li, 2007). The following section covers the different types of KPIs used in different studies and are summarized at the end of the section.

Yeung et al., (2012) in Hong Kong, used a method called reliability interval method (RIM) as a benchmarking method to measure project success (Yeung, Chan, Chan, Chiang, & Yang, 2012). In this study, they identified 10 KPIs with weights to formulate a composite performance index (CPI). The KPIs that were identified were safety, cost, time, quality, client satisfaction, effectiveness of communication, end user satisfaction, effectiveness of planning, functionality and environmental performance (Yeung, Chan, Chan, Chiang, & Yang, 2012).

In another study, the correlation for the quantitative and qualitative indicators were performed in order to find the most extensively used indicator. Though the correlation between the quantitative and qualitative indicators were inconclusive, there were 6 indicators that were reported useful. They were found to be on-time completion, cost, safety, quality control, time and units per man-hour (Cox et al., 2003).

Almahmoud, Doloi, Panuwatwanich (2012) in their study in Saudi Arabia, used the Swiss Cheese model in order to guide the links between the Public Health Check framework and KPIs (Almahmoud, Doloi, & Panuwatwanich, 2012). The study was done in order to help project managers to manage project performance more efficiently. The important KPIs that were identified are cost, schedule, quality, safety, customer satisfaction and scope management (Almahmoud et al., 2012).

Another way to measure the project performance was based on perspectives. They identified three perspectives namely financial, customer and internal business. In the financial perspectives, the measures were profitability, growth, financial stability and cash flow. The customer perspective included quality of service and work, external customer satisfaction and market share while the internal business perspective included safety, business efficiency and effectiveness of planning (Ali, Al-Sulaihi, & Al-Gahtani, 2013).

The Architectural, Engineering and Construction (AEC) firms, found it difficult to adapt to the operating environment. This study helped determine the performance level of the projects in China and thereby



achieve project success. The measures that were used to measure project performance were cost, time and quality (Ling, Low, Wang, & Lim, 2009).

Luu, Kim and Hyunh (2008) did a study to benchmark the project management performance from the viewpoint of a contractor. They used typically 9 KPIs to benchmark their performance. They were cost performance, time performance, customer satisfaction on services, customer satisfaction on products, quality management system, project team performance, safety management, change management and material management. The benchmarking approach helped the company to learn the best practices and apply them to improve in a continuous manner (Luu, Kim, & Huynh, 2008).

A construction company undertook a study to find the metrics for project performance. Cost, time, scope and safety, quality innovation and sustainability were the metrics identified from the study. These benchmark metrics were filtered on the basis of national and international benchmarking techniques. Finally, this study entailed a set of metrics, collection as well as reporting methodologies (Rankin, Fayek, Meade, Haas, & Manseau, 2008).

In a study based on Enterprise Resource Planning (ERP) systems, KPIs were defined to have 2 types of specificities: - knowledge and time. The KPIs that were used for this study were cost performance, time performance, predictability of cost and time, client satisfaction, productivity, profitability, safety and defects which is 9 in total. This study helped in implementation of ERP by practitioners and researchers in their respective firms (Skibniewski & Ghosh, 2009). The summary of all the key performance indicators derived from the various authors from literature are described in Table 3.

Table 3: Summary of the key performance indicators (KPIs) from literature

Key Performance Indicators (KPIs)	Yeung et al., 2007	Yeung et al., 2012	Rankin et al., 2008	Skibniewski and Ghosh (2009)	Luu et al., 2008	Ling et al., 2009	Ali et al., 2013	Almahmoud et al., 2012	Cox et al., 2003
Cost	X	X	X	X	X	X		X	X
Time	X	X	X	X	X	X		X	X
Quality	X	X	X		X	X		X	X
Safety and Defects		X	X	X			X	X	X
Scope					X	X		X	
Customer /Client satisfaction		X	X	X	X		X		
Sustainability		X	X						
Change and material management					X				
Units per man hour					X				X
Communication	X								
Trust and respect	X								
Top management commitment	X								
Predictability of cost and time				X					

There were 13 KPIs that were identified based on the works of 9 different authors. We find that of the 13 KPIs three of the KPIs have been used to measure project performance by 8 of the authors. Hence, the three KPIs were chosen in this research study to measure project performance and used in the formulation

of the conceptual framework. Since, the KPIs were easily identifiable unlike the hard and soft skills from literature review, they were directly used in the formulation of the conceptual framework.

The relationship between managerial competencies and the site performance in an organization has been shown to be positive from the study conducted in one major division of a Fortune 500 products company. This division was spread in the United States and was concentrated based on population in each of the states. There were weighted scores given based on performance indicators like shipment accuracy, defects and they were found to be positively correlated to managerial competencies (Levenson, Van der Stede, & Cohen, 2006).

With the above discussion, we come up with the third hypothesis

*H3: Competencies influence KPIs positively*

## 2.6 Conceptual Framework

The project management competencies that were identified based on the literature review are operationalized based on the findings of the different authors. The three variables operationalized in this study are hard skills, soft skills and key performance indicators as they are potential candidates to address the problem statement. Literature was hence divided into 3 categories: - Hard skills, Soft Skills and Key Performance indicators.

Semi-structured interviews were conducted with two experts in order to find the important hard and soft skills for the project managers at Philips. This was done as the literature review shone light on many hard and soft skills and it was difficult to determine the hard and soft skills specific for Philips project managers and the list was 8 in number for each of the skills. The list of hard and soft skills from literature were presented and the experts were asked to select the most important for project managers at Philips. The experts had to tick the important skills that are important for the project managers at Philips. This questionnaire was consolidated based on both the experts ticking the same skills and then included in the conceptual framework. The interview guide can be found in the Appendix.

### 2.6.1 Formulation of the conceptual framework

The interview with the experts was done in order to determine the hard and soft skills. **Integration Management** was included as the project manager at Philips were involved in getting the different processes like 3rd parties, logistical challenges, building works etc., together. **Scope Management** was included in order for the project manager to agree on what the project entails to deliver to the customer

at the start of the project. **Time Management** was included for project managers as they had to plan and schedule the project so that there are no expenses like storing the equipment in a warehouse, delay in handing over the equipment to the customer etc. **Cost Management** is included as the stipulated costs that is determined during the planning of the project is not exceeded and also try and reduce the costs of logistics and labour to a minimum. **Human Resource Management** is included as the project manager should be able to handle the project personnel and make sure the right person is doing the right job. **Communication Management** was included as the project manager must be communicate with the different stakeholders involved in the project as well as communicate with the project team to be aligned with the goal of the project. **Risk Management** is included as there are external and internal stakeholders and the risk of their expectations not being met and the project manager must be able to handle all of this risk. **Stakeholder Management** is important as the project manager is involved with many people in a project. As mentioned in the process framework in Fig 1., there are account managers, lead installers and application specialists that are stakeholders of the project other than the customers. The project manager must make sure that all of the mentioned personnel know what, when and how the project must be carried out and also keep all stakeholders interested.

With respect to the soft skills, **team building** is included in order to make sure that the project manager has a clear view of what is expected of the team and how to help develop them for the future. **Conflict resolution** is included as the project manager must be able to resolve conflict among stakeholders, be capable to keep the customer happy at all times and also not add excess costs to the project. **Problem solving** is very important for the project manager as when a problem arises, the project manager must be able to target the root cause of the problem. The project manager should make sure that the project does not run into the same issue again. **Negotiation** is also related to scope management and a soft skill in which the project manager gives in to a few bargains and wins few bargains with stakeholders, but it is important where and when to negotiate in the project. **Leadership** is included as the experts felt that the ability to lead a project by example was important. **Commitment** was included as the project manager had to really be involved in the daily activities and create initiatives that further improved redundant processes and by doing so add greater value to the organization as a whole. **Work under pressure** is the next soft skill to be selected as often, the team might face situations where there are clashes in opinions amongst the project personnel and also between the project personnel and the stakeholders. The project managers should be good enough to handle such pressures and still deliver on the scope of the project. The last soft skill selected is **attention to detail**. This was included to make sure that the project documents are in order and the project manager is also able to follow standard procedures in handling customers, installations, handover of equipment and also after sales services. The KPIs could be derived from

literature to be cost, time and quality. Most studies used these three indicators and hence was easier to narrow down the KPIs for this study. With the help of these interviews and literature, the final conceptual framework for this study was established. (P. Goeree, personal communication, June 2017; L. Soto, personal communication, June, 2017).

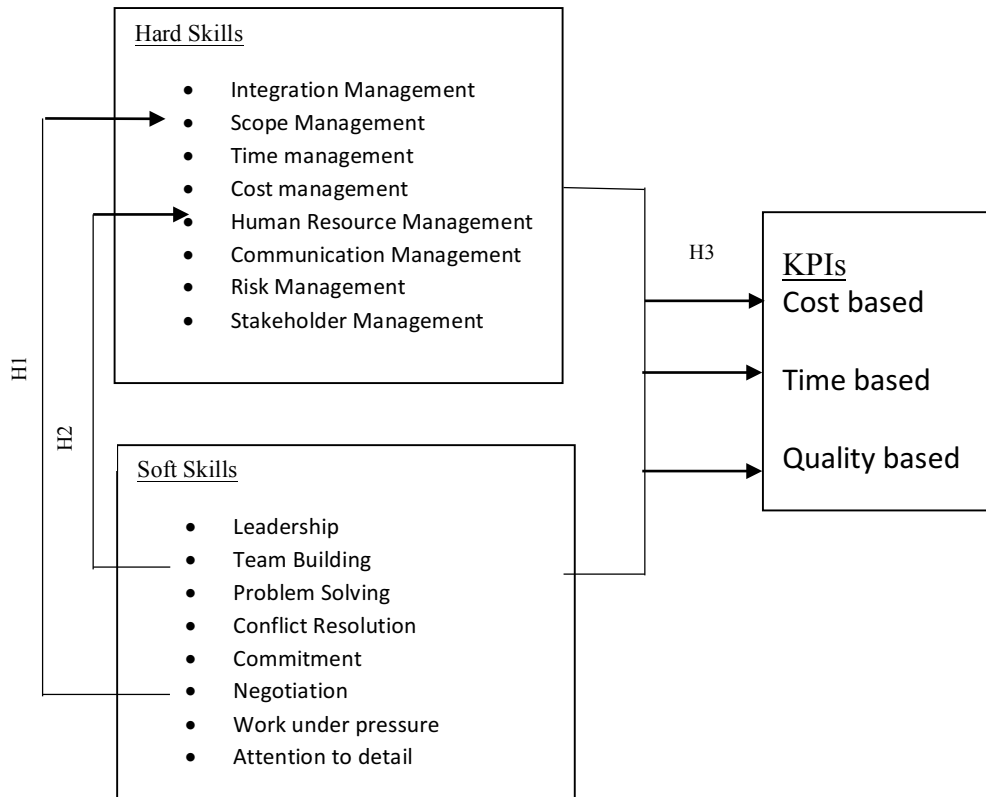


Fig 2: Conceptual Framework

### 3. Research Design

The empirical research for this study consisted of a questionnaire for the CPMs. The questionnaire was used to test the hypothesis that were identified from the conceptual framework. Expert interviews were conducted during the formulation of the conceptual framework. The approach of the questionnaire was exploratory.

#### 3.1 Sample Design

The type of sampling that was used for this research study is purposive sampling. This type of sampling is done, in order to identify and select information-rich samples and to maximize efficiency and validity of the study. This sampling method is non-random and is done in order to cover the biggest markets (Kumar, 2010). India and China are huge markets consisting of 58 project managers in total. The 2 selected markets covered approximately one-third of the project managers at Philips and hence were chosen.

Two interviews were conducted with experts, in order to select from the derived competencies from the literature review. The interviews were done to select the important soft and hard skills that were identified from the literature review. Another reason for conducting the interviews were to coincide with the interests of Philips. During the course of the interview, the experts were asked to mention important competencies for project managers at Philips. The list of competencies derived from literature review was not presented initially to the experts to avoid bias in response. This was done to identify other competencies that were not identified through the literature review. Semi-structured interviews were conducted with experts to not lose focus of the topic. The interviews on an average took around 50 minutes to be completed. These experts were specifically chosen as they were involved in developing competencies of CPMs. The interviewed experts had 10+ years of experience as project managers at Philips. The interviews were analysed using content analysis to identify expectations from project managers. The interviews were also recorded to not miss out on the details.

The chosen hard skills, soft skills and KPIs from the conceptual framework are then used to formulate a questionnaire that is sent via email to the project managers in India and China. The questionnaire was used as the research instrument. The questionnaire consisted of 2 parts. The first part of the questionnaire consisted of nominal variables like years of experience, certification status, email id and market name. The second part of the questionnaire consisted of ordinal variables that covered the hard skills, soft skills and KPIs. The questionnaire used a 7-point Likert scale with closed questions in order to measure the

hard, soft skills and KPIs. A 7-point Likert scale was chosen so that there is more distinction between each item on the scale and the project managers can choose according to each of the skills and KPIs. For the hard, soft skills and the KPIs, the 2 extreme possibilities on the Likert scale were “Strongly Disagree” to “Strongly Agree”. A pre-test was done in order to make sure that the questions were clear and understandable by testing the questionnaire on 3 project managers from the central team at Philips. The questionnaire was sent via email to the project managers of India and China to assess themselves. The questionnaire was kept open for a period of 2 weeks from the 15<sup>th</sup> of July to the 30<sup>th</sup> of July. Enough time was given for the project managers to complete the questionnaire and confirm the responses. The data from the questionnaire was used as the primary source for data.

KPI data for each of the project managers based on the cost, time and quality were used from the company database to compare with the data of the project managers from the questionnaire and make sure both data coincide. The comparison was done to make sure that the project manager’s performance from the questionnaire and the company data were not different. The responses from the survey were first downloaded and then compared with the company database. Due to confidential reasons, the entire excerpt of the database is not revealed. The responses of the questionnaire for the performance alone, were checked using the company database and corrected if the project manager gave a different response.

### 3.2. Scale validity and reliability

The questionnaire was formulated using previous studies to promote content validity. To measure the hard skills, previous work of Ling et al., (2009) was used (Ling et al., 2009). To measure the soft skills, (Arnold, Arad, Rhoades, & Drasgow, 2000), (Allen & Meyer, 1990), (Pinto & Kharbanda, 1995), (Troukens, 2013) and (Englund, 2010) were used. To measure the KPIs, (Yeung et al., 2007) and (El-Sabaa, 2001) were used. The control variables years of experience and certification were also used based on previous studies done by (Levenson et al., 2006) and (Mahaney & Greer, 2004).

The Cronbach’s alpha test is the most common reliability test used to determine the consistency of the scale being used (Field, 2013). The acceptable value of Cronbach’s alpha varies between 0.7 to 0.8 to be a reliable scale. The Cronbach’s alpha was found for both hard and soft skills separately. This was done in order to find the mean score of the 8 variables involved for both hard and soft skills. The Cronbach’s alpha value for hard skills was found to be 0.768 for hard skills and 0.772 for soft skills. Hence, the chosen Likert scale for this study is reliable. The mean score of the variables were combined to form 2 new variables: - one for hard skill and one for soft skill. Hard Skill variable consisted of the mean score of the 8 variables for hard skills and soft skill was formed using the mean score of the 8 variables for soft skills.

## 4. Results

### 4.1 Results of the questionnaire

The number of respondents of CPMs provided by Philips in the markets of India and China were 21 and 39 respectively. There were 2 extra responses from the CPMs in China due to addition of 2 new CPMs in the China market. The questionnaire was sent via email and all the CPMs responded. Therefore, the response rate for the questionnaire was a 100%. The central team of Philips in The Netherlands helped by sending an additional email to the CPMs in India and China, in order to make them realize the importance of the questionnaire. This might also be a possible reason in order to receive 100% response. The non-response bias for this study is hence low as the response rate is high and there is no underrepresentation of the population (Berg, 2005). Even though, the questionnaire was a little lengthy, due to the support from the central team of Philips, the respondents sent in their responses.

#### 4.1.1. General Demographics

General demographics cover criteria like years of experience, certification status and average project size of the project managers in India and China. The general demographics of the population can be seen in Table 4, Table 5 and Table 6. Table 4 shows the years of experience of the project managers in both India and China. The cumulative percentage of project managers that are present in the years of experience between 0-8 years was 73% of the total population. The remaining 27% accounted for project managers with more than 8 years of experience, who are able to guide the less experienced project managers. There is an approximate ratio of 1:3 (experienced: inexperience) project managers on an average considering both markets together.

Table 4: Years of experience of the sample population

Years of experience	Frequency	Percent
0-3	20	33
4-8	24	40
9-12	12	20
12+	4	7
<b>Total</b>	<b>60</b>	<b>100</b>

Table 5 describes the certification status of the project managers in both India and China. The certification considered for the certification status is the Project Management Professional (PMP). PMP is the most recognized certification in the project management industry (Snyder, 2014). Only 28% of the project



managers were certified with PMP and the remaining 72% were not certified. There were some project managers in the entire population who were not certified in PMP but in other certifications like Philips Foundation certification and Philips practitioner certification. This was found to be the internal certification of Philips in project management. Eventhough, the number of PMP certified project managers are less in number, we see that there are other certifications that have been done internally by project managers at Philips.

Table 5: Certification Status (PMP) of the sample population

<b>Certification Status (PMP)</b>	<b>Frequency</b>	<b>Percent</b>
Certified	17	28
Not Certified	43	72
<b>Total</b>	<b>60</b>	<b>100</b>

The average project size is used to determine the value of the project handled by the project managers in India and China. In table 6, we observe that 42% of the projects handled by project managers in the aforementioned markets were small in size, meaning their average value was less than 1 million euro. Further, 30% of the projects were medium sized projects with an average value of 1-2 million euro and 28% of the projects were large in size with an average value greater than 2 million euros. There are more number of small sized projects and an equal number of medium and large sized projects handled by the project managers in India and China.

Table 6: Average project size of the sample population

<b>Average project size</b>	<b>Frequency</b>	<b>Percent</b>
Small project	25	42
Medium project	18	30
Large project	17	28
<b>Total</b>	<b>60</b>	<b>100</b>

The general demographics helped us identify the different criteria of the population for this research study. The years of experience, certification status and the average project size of the project managers involved were discussed. Further, we would look at the distribution of the data and appropriate tests for statistical analysis.

#### 4.1.2. Skewness and kurtosis

The 2 important factors that determine the distribution of data are the pointiness (kurtosis) and the symmetry (skewness). When the data is normally distributed, the curve is symmetrical around the centre. If not, then the data is not normally distributed (Field, 2013).

The skewness value of the data was found to be 0.655 for Soft Skill, 0.636 for Hard Skill and 2.097 for KPIs. The Z-value (Skewness/Std. error) for skewness was calculated to be 2.11, 2.058 and 6.786 for variables Soft Skill, Hard Skill and KPIs respectively. The Z-value for skewness should lie between the value -1.96 to +1.96 to be normally distributed (Field, 2013). Since, the Z-value does not lie between -1.96 and +1.96, Soft Skill, Hard Skill and KPIs are not normally distributed.

The kurtosis value for the data was found out to be 0.558 for the variable Soft Skill, 0.008 for Hard Skill and 7.353 for KPIs. The Z-value (Kurtosis /Std. error) for kurtosis is calculated to be 0.917,0.01 and 12.09 for variables Soft Skill, Hard Skill and KPIs respectively. The Z-value for skewness should lie between the value -1.96 to +1.96 to be normally distributed (Field, 2013). Eventhough, the Hard Skill and Soft Skill lie between -1.96 to + 1.96, KPIs are well above the range. Hence, we conclude that the data is not normally distributed.

Table 7: Kurtosis and Skewness for distribution of data

<b>Skewness and Kurtosis of data</b>			
	Soft Skill	Hard Skill	KPIs
<b>Skewness</b>	,655	,636	2,097
Std. Error of Skewness	,309	,309	,309
<b>Kurtosis</b>	,558	,008	7,353
Std. Error of Kurtosis	,608	,608	,608

Since the variables Soft Skills, Hard Skills and KPIs do not satisfy both the Kurtosis and Skewness test, the data is not normally distributed. A non-parametric test is used usually when there is not a normal

distribution (Field, 2013). Spearman’s rho correlation coefficient which is a non-parametric statistic was used to find the relationships between the variables in the research study.

The main focus of testing the hypothesis of this research study is to come up with a multiple regression model. To come up with a multiple regression model there are pre-requisites to satisfy in order to run a regression model. They are scatterplots, correlations and multicollinearity. The scatterplots of all the hypothesis can be found in the Appendix. The correlations and multicollinearity tests can be found under sub-sections 4.2, 4.3 and 4.4. The multicollinearity will not be a problem for hypothesis 1 and hypothesis 2 as there is only one independent variable whereas in the case of the 3<sup>rd</sup> hypothesis, multicollinearity tests are performed to find possible interactions within the independent variables. Finally, a regression model analysis based on all the hypothesis is done and the coefficients in each of the regression model is explained on the conceptual model.

#### 4.2. Findings related to Hypothesis 1

The first hypothesis stated that scope management influences negotiation. Spearman’s rho correlation coefficient is used to measure the correlation between the 2 identified variables (Field, 2013). There is a significant correlation between the chosen variables negotiation and scope management with a correlation coefficient value of 0.391 which can be found in Table \*. The p-value was lower than 0.01 and hence, the correlation is significant.

Table 8: Relationship between Scope Management and Negotiation

		Negotiation	Scope Management
Spearman's rho	Negotiation	1,000	
	Scope Management	,391**	1,000

\*\* . Correlation is significant at the 0.01 level (2-tailed).

#### 4.3. Findings related to Hypothesis 2

The second hypothesis stated that human resource management influences team building. Spearman’s rho correlation coefficient is used to measure the correlation between the 2 identified variables (Field, 2013). There is a significant correlation between the chosen variables human resource management and

team building with a correlation coefficient value of 0.365 which can be found in Table 9. The p-value was lower than 0.01 and hence, the correlation is significant.

Table 9: Relationship between Human Resource Management and Team Building

		Team Building	Human Resource Management
Spearman's rho	Team Building	1,000	
	Human Resource Management	,365**	1,000

\*\* . Correlation is significant at the 0.01 level (2-tailed).

#### 4.4. Findings related to Hypothesis 3

The third hypothesis stated that competencies influence KPIs positively. Spearman's rho correlation coefficient is used to measure the correlation between the variables hard skills, soft skills and KPIs based on cost, time and quality. The correlation value was found to be 0.670 between the hard and soft skills. This showed that there was a severe multicollinearity problem that arises when there is a regression model for this relationship. However, we also see that there are no significant correlations between the hard and soft skills with either cost, time or quality based KPIs. The values for the correlation are shown in Table 10.

Table 10: Correlations between hard, soft skills and KPI based on cost, time and quality

	Hard Skills	Soft Skills	Cost based	Time based	Quality based
Hard Skills	1				
Soft Skills	,670**	1			
Cost based	-,015	,076	1		
Time based	-,005	-,117	,073	1	
Quality based	-,051	,097	,079	,038	1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The summary of the multiple regression results is explained in Table 11. “R value” explains the correlation between the independent variable (IV) and the dependent variable (DV) in the study. For example, in the first hypothesis, the DV is scope management and the independent variable is negotiation. The “R<sup>2</sup>” explains the amount of variation in the DV accounted by the regression model. For example, 15.8% of the variance in scope management is caused by negotiation skills. “ANOVA” or the Analysis of Variance test is used to measure if the model can significantly predict the DV. In hypothesis 1, the p-value for ANOVA is significant as the value is below 0.01. “Unstandardized coefficients” are those value that form the constant value of the IV in the model. The “t-value” explains if the IV is making a significant contribution to the regression model. The t-value also has a contribution to the Unstandardized coefficients (B) (Field, 2013). Figure 3 also illustrates the conceptual framework with the regression results.

Table 11: Multiple regression of all hypotheses in the conceptual model

Hypotheses	R value	R <sup>2</sup>	ANOVA (p-value)	Unstandardized coefficients (B)	t-value	p-value
<b>Hypothesis 1</b>	0.398	0.158	0.002**	0.531	3.302	0.002**
<b>Hypothesis 2</b>	0.299	0.089	0.020*	0.641	2.386	0.020**
<b>Hypothesis 3 (cost)</b>	0.076	0.006	0.563 <sup>NS</sup>	0.030	0.582	0.563 <sup>NS</sup>
<b>Hypothesis 3 (time)</b>	0.117	0.014	0.374 <sup>NS</sup>	-0.080	-0.896	0.374 <sup>NS</sup>
<b>Hypothesis 3 (quality)</b>	0.097	0.009	0.459 <sup>NS</sup>	0.059	0.745	0.459 <sup>NS</sup>

\*indicates significance at p <0.05\*\*indicates significance at p<0.01, NS- Not Significant

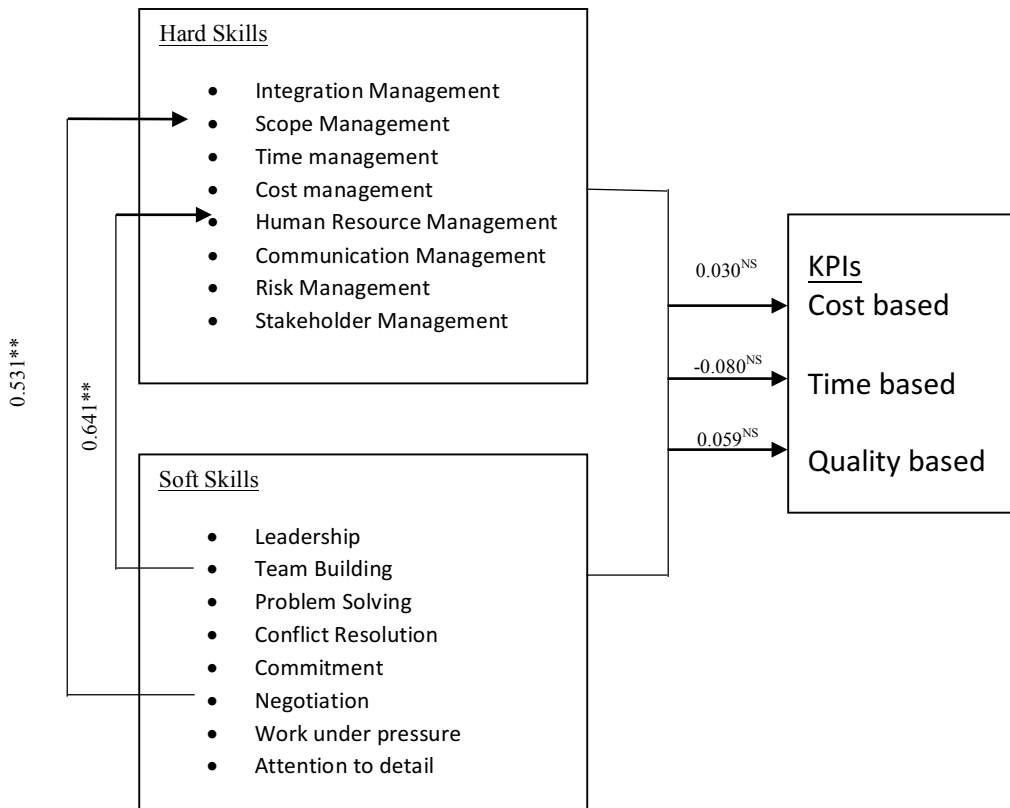


Fig 3: Conceptual framework with results from regression

For the hypotheses 1 and 2, we can conclude from the regression that there is a significant relationship between scope management and negotiation and human resource management and team building. There is a significant p-value for ANOVA, making the regression model significant. The null hypotheses is hence accepted for both hypotheses 1 and 2. Also, from the above regressions, we can conclude that there are no significant correlations between both hard and soft skills and the KPIs based on cost, time and quality. Hypothesis 3 faces severe multicollinearity problems due to the relationship between hard and soft skills and hence only one of the skills was used in the model. Even after using only either of the skills, there was no significant relationship in the regression model and hence the null hypothesis was rejected.

After finding the regression model based on the data, the influence of control variables-years of experience and certification status is checked on the hard and soft skills.

### <sup>3</sup>4.5. Years of Experience on hard and soft skills

Years of experience was an important control variable that was included in the study in order to find its effect on the hard and soft skills (Levenson et al., 2006). Partial Correlation is a statistical method used to

<sup>3</sup> The Chi-square tests did not yield useful and significant results and hence were not discussed as part of the results.

identify the correlation between 2 variables when the effects of other variables are held constant (Field, 2013). The correlations between hard and soft skills are measured when years of experience is kept a constant and the resulting variance is greater than the individual variance observed (29.05% vs 38.3%) from Table 12. The p-value is also less than 0.05 and hence there is a unique variance that years of experience offer as a control variable to hard and soft skills.

Table 12: Partial correlation of years of experience and hard, soft skills

Control Variables		Hard Skill	Soft Skill
Years of Experience	Hard Skill	1,000	
	Soft Skill	,619	1,000

#### 4.6. Certification on hard and soft skills

Certification was another important control variable that was included in the study in order to find its effect on the hard and soft skills (Levenson et al., 2006). Partial Correlation was also used to find the effect of certification status on hard and soft skills. The correlations between hard and soft skills are measured when certification status is kept a constant and the resulting variance is greater than the individual variance observed (29.05% vs 46.51%) from Table 13. The p-value is also less than 0.05 and hence there is a unique variance that certification status offers as a control variable to hard and soft skills.

Table 13: Partial Correlation of certification status and hard, soft skills

Control Variables		Hard Skill	Soft Skill
Certification	Hard Skill	1,000	
	Soft Skill	,682	1,000

Hence, we see that years of experience and certification status play an important role in causing variance in both hard and soft skill when included.

#### 4.7. Additional relationships

The hard skills and soft skills were found to have correlations amongst themselves. This part of the results section will discuss such correlations.

In hard skills, integration management was highly correlated to scope management while stakeholder management was correlated to communication management. Scope management and risk management were also highly correlated. Additionally, product knowledge and scope management had a high correlation. In soft skills, team building had the highest correlation with commitment among other correlations. Similarly, negotiation had a high correlation with work pressure. Leadership also had a high correlation with commitment while attention to detail and conflict resolution had a high correlation with negotiation. The correlation values are available as part of the Appendix.

These relationships also tell us that the people who perform project work should really be well equipped enough to handle the project (Cowie, 2003). These relationships also tell us that the project managers should improve both the hard and soft skills equally to drive project success as both skills are important (Turner & Huemann, 2000).

There were many relationships between the hard and soft skills. The hard skills had significant correlations with leadership, commitment, conflict resolution, commitment, working under pressure, problem solving and attention to detail. This is also in accordance that technical skills are not enough to be successful project managers but combine that technical skills with soft skills to be effective (Gillard, 2009). The values of the correlations between the hard and soft skills can be found in the Appendix.



## 5. Discussion

### 5.1. Discussion regarding H1

The data analysis significantly confirms the first hypothesis which states that scope management influences negotiation. This result is in accordance with the authors (Meredith & Mantel Jr, 2011) and (Edum-Fotwe & McCaffer, 2000). The possible reasons could be negotiation skills are used to determine the scope objectives and change of scope. Englund (2010) also reiterates the importance in determining the scope and also agree on the scope of the project with all the involved stakeholders (Englund, 2010). Schulz (2008) explains how the soft skills like negotiation need to be embedded in hard skills like scope management and in turn improve both the skills (Schulz, 2008). The interviews with the experts also revealed that scope management and negotiation are related. The experts interview also revealed the importance of negotiation as “the project manager gives in to a few bargains and wins few bargains with stakeholders, but it is important where and when to negotiate in the project”. On the other hand, scope management was included as “in order for the project manager to agree on what the project entails to deliver to the customer at the start of the project”. Both scope management and negotiation deals with agreeing with each of the stakeholders and deciding the scope of a project, which explains the relationship between the two skills. Hence, the results for hypothesis 1 are also in line with the literature and the interviews.

### 5.2. Discussion regarding H2

The regression analysis confirms that the second hypothesis which states that HRM is influenced by team building is significant with a p-value of 0.002 for the regression model.. This result is in accordance with the authors (Ding et al., 2015; Starkweather & Stevenson, 2011). The possible reasons for the relationship could be that training and development is important to develop capabilities in HRM. This in turn, helps to bring about organizational change. One important aspect of training and development is team building which explains the possible significant correlation with HRM. HRM also focusses on soft skill training in order to develop human resources that would lead to enhanced performance and profitability (Menon, 2012). The expert interview also explains HRM as “should be able to handle the project personnel and make sure the right person is doing the right job” and team building as “the project manager has a clear view of what is expected of the team and how to help develop them for the future.” Hence, team building plays a significant role in influencing one aspect of HRM which is important to help develop project personnel in the future. The possible reason for the significance could also be that both HRM and team building are used to handle the project team and also develop the project personnel for the future.

### 5.3. Discussion regarding H3

The third hypothesis states that competencies are influenced positively by KPIs. There was no significance in neither the scatterplots and correlations nor in the multiple regression analysis obtained. Hence the null hypothesis was rejected. The results are in accordance with (Fayek & Omar, 2016). The possible reasons for the lack of significance could be that the chosen project competencies may not be suitable for assessment. This may very well be possible because project competencies require detailing that can possibly capture the behaviour. The authors explain that project competencies are often described in a broad sense based on a few performance indicators. This might be a possible reason for the inaccurate evaluation of competencies (Markus, Thomas, & Allpress, 2005). The regression analysis also backs up claims that competencies are seldom used as leading indicators (Levenson et al., 2006). Another possible reason for the lack of significance of correlation is the establishment of a competency system. The establishment of a competency based system in the organization plays a key role in the competencies, influencing the performance based on KPIs (Levenson et al., 2006). A competency system includes; competency levels, human capital variables, understanding, perceived fairness and mentoring as part of the system (Levenson et al., 2006). This kind of system may help in development of the project managers and also influence the performance based on cost, time and quality positively. This competency system serves as a recommendation to Philips Healthcare and for companies in general. Hence, the formulation of a competency system may be the next steps in terms of further research.

## 6. Conclusion and further research

The hard skill and soft skill attribute of competencies play an important role for project managers. The project managers benefit a lot by developing these competencies and support the improvement of project performance (Levenson et al., 2006). This study entailed five sub research questions that were to be answered. The first sub research question was “What are the hard skills that are required by a project manager?”. An extensive literature study was first conducted to identify the important hard skills required for a project manager followed by interviews with experts to narrow down the number of important hard skills for project manager to a manageable number. The hard skills that were required by a project manager include integration management, scope management, cost management, time management, stakeholder management, human resource management, communication management, risk management. The second sub research question was “What are the soft skills that are required by a project manager?”. Similar to the hard skills above, an extensive literature study followed by interviews with experts was done to narrow down the number of important soft skills to a manageable number. The soft skills that were required by a project manager include leadership, team building, problem solving, attention to details, negotiation, conflict resolution, work under pressure and commitment. The third sub research question was “What KPIs are used to measure the project performance?”. An extensive literature study was done in order to find out the most commonly used KPIs to measure project performance. The literature review concluded on three KPIs, namely: cost performance, time performance and quality performance. The identified hard skills, soft skills and the KPIs based on cost, time and quality were used to formulate the conceptual framework.

The fourth and fifth sub research questions were “How are the KPIs influenced by the hard skills of a project manager?” and “How are the KPIs influenced by the soft skills of a project manager?”. The answers to the fourth and fifth sub research question were determined empirically. There was no significance in the regression analysis between the hard skills and KPIs and the soft skills and the KPIs. There were three hypotheses derived from the extensive literature review that helped answer the fourth and fifth sub research question. The first and the second hypothesis demonstrates how scope management is influenced by negotiation and also the influence of team building on HRM. Both the hypothesis had a significant p-value for the regression model derived. Eventhough, there were no significant relationships between the hard and soft skills with the KPIs, the research helps in adding the existing literature of how soft and hard skills are equally important for project managers. The third hypothesis answers the question by finding that there was no significant relationship between the hard and soft skills and the KPIs based on cost, time and quality. This was verified through the scatterplots, correlations and regression analysis

conducted with the hard skills, soft skills as independent variables and KPIs based on cost, time and quality as the dependent variables.

From this study, we learn that a competency system should be put in place in order to influence the performance of CPMs rather than using a simple mechanism of measuring competencies (Levenson et al., 2006). This also serves as a starting point for further research to find the influence of competencies on KPIs. However, more research needs to be done to develop a competency system specific to Philips and to find the relationships between project management competencies and KPIs.

Another interesting finding of this research is the influence of years of experience and certification status and the amount of variance they cause on the hard and soft skills. Since there were relationships between scope management and negotiation and human resource management and team building respectively, there might be more such relationships which can be a point for further studies. The linking of competencies and project performance needs to be still standardized so that the system can be adopted irrespective of industry which is also interesting for further study. Another aspect for further research is to identify a strategy to create a suitable competency system which can influence KPIs and hence improve project performance.

## 7. Limitations of Research

This research was done only in the markets of India and China. The impact of this research on other parts of the world is one area for further research. Another limitation is the cultural barrier and the working styles exhibited by different markets as they are different for different countries.

To gain a high reliability in this study, it is important that the questionnaire is very clear. The participants must understand every single question and the questionnaire should not have ambiguous questions. Since the questionnaire was sent via email there might be possibilities of confusion for certain questions. The research design used is a cross sectional design and the data received from the project managers only explain the competencies of project managers at one point in time. The questionnaire is handed to the project managers to do a self-assessment and hence there might be some bias in the responses. The number of participants in this study were very less as this was done only in the markets of India and China. When this study is extended to other markets, then there is more data in order to conduct more statistical analysis like factor analysis.

## 8. Appendix

### Interview Guide for experts

1. How long is this project being done and what was done before to know the level of competence of project managers?
2. Why are competencies important for project managers at Philips?
3. What are the most important competencies with regards to project management hard skills according to you?
4. What are the most important competencies with regards to project management soft skills according to you?
5. Choose from the list of competencies derived from literature the most important for project managers in Philips?
6. Why were each of the competencies selected and why are they important to the project managers at Philips?
7. Do you think any other competencies should be added to this list other than these?
8. Do you think as a project manager, year of experience and certification play a role in developing competencies?
9. Why is it important to link competencies and performance?
10. Any other KPI other than SS, DPQ, PBV that are important to track the performance of a CPM?

### Questionnaire for CPMs with the variable names used in SPSS

Question	Variable used	Source
Gender	GENDER	General Demographics
What is your email id?	-	General Demographics
Years of experience as a project manager (including experiences in other companies)	YOE	Literature
What is your certification status? (PMP Certification)	CERT1	Literature
Please mention any other Project Management related certifications if completed. If not, type N/A	-	General Demographics
What is your market name?	MARKET	General Demographics
Integration management: I am able to prioritize my tasks based on project objectives	IM1	Literature

I am able to integrate the different project management processes like initiation, planning, execution, monitoring and controlling and closing	IM2	Literature
Scope Management: I am able to frequently monitor the scope of the project to identify changes	SM1	Literature
I am able to validate the scope of the project at the beginning of the project	SM2	Literature
Time Management: I am able to quickly respond to the client's changes	TM1	Literature
I am able to complete the project on schedule	TM2	Literature
Cost Management: I am able to validate the cost of resources for the project	CM1	Literature
I am able to monitor cost overruns	CM2	Literature
Human Resource Management: There are adequate project personnel for the project	HRM1	Literature
There are many team building activities organized for the team	HRM2	Literature
Training is given regularly to all project personnel	HRM3	Literature
Communications Management: I have a good working relationship with the client	COM1	Literature
I often communicate with the client to make sure the project is going as per plan	COM2	Literature
I often communicate with my team members to make sure that the project objective is clear	COM3	Literature
Risk Management: I am able to handle major risks in my project	RM1	Literature
I am able to control the resource/supply availability	RM2	Literature
Stakeholder Management: I am able to work with the suppliers of the product	STAK1	Literature
I am able to work with technical people to install the health system	STAK2	Literature
Product Knowledge: I have knowledge about all the current products available	PROD1	Interview
I have the knowledge about all the new products that are available	PROD2	Interview
I lead by example in a project	LEAD1	Literature
I work as hard as anyone in the group	LEAD	Literature
I solve the problems that arise in the project individually	PROB1	Literature
I collaborate with the team to solve the problems	PROB2	Literature

I am involved in taking the decisions regarding the workload	COMMIT1	Literature
My work contributes to the organization at large	COMMIT2	Literature
I encourage the team members to express ideas/suggestions	TEAM1	Literature
I listen to team suggestions to make decisions regarding the team	TEAM2	Literature
I deal with conflict in a rational way	CONF1	Literature
I seek and expose the underlying root cause of the conflict	CONF2	Literature
I am able to create a good working relationship when working with people	NEGO1	Literature
I am able to understand the interests of stakeholders to create common ground.	NEGO2	Literature
I am able to handle unrest in the team	WUP1	Literature
I am able to work with a clear mind when the project is not going as per plan.	WUP2	Literature
I make sure that the project is well documented	ATD1	Literature
I make sure the project follows standard procedures	ATD2	Literature
What is the average size of your current project?	AVGSIZE	Literature
The cost of the project is on budget	CP1	Literature
The cost of the project is over budget	CP2	Literature
The time taken to complete the project is on schedule	TIME1	Literature
The time taken to complete the project is behind schedule	TIME2	Literature
The project is high quality (eg. the correct details of the order are collected and maintained)	QP1	Literature
The project is of moderate quality (eg. the correct details of the order are collected but not maintained properly)	QP2	Literature
If there are other competencies that you would like to be included, please mention so. If not, N/A.	-	-

### **Correlations between hard and soft skills**



<b>Hard/Soft Skills</b>	Leadership	Team Building	Problem Solving	Conflict Resolution	Commitment	Negotiation	Work Under pressure	Attention to Detail
Integration Management	0.516**	0.391**		0.378**	0.534**	0.327*	0.285*	0.296*
Scope Management	0.328*	0.332**		0.477**	0.317*	0.391**	0.324*	0.302*
Time Management					0.362**	0.402**	0.326*	
Cost Management		0.428**			0.380**	0.287*	0.341**	
Human resource Management		0.365**		0.370**		0.307*	0.268*	
Communication Management	0.436**	0.484**		0.462**	0.443**	0.430**	0.407**	
Risk Management	0.387**	0.299*		0.449**	0.310*	0.384**	0.424**	0.266*
Stakeholder Management	0.438**			0.469**	0.374**	0.359**	0.301*	
Product knowledge			-0.281*	0.322*		0.272*		

\*P<0.05

\*\*P<0.01

### **Definitions of Knowledge areas for questionnaire**

<b>Knowledge area</b>	<b>Definition</b>
Project Integration Management	To identify, define, combine and integrate project management activities and processes
Project Scope Management	Make sure that the project delivers on the scope that has accepted and make sure the project stays within scope.
Project Time Management	Make sure that the project is completed on time and delays are avoided
Project Cost Management	Used to determine the costs for budget by planning, estimating and controlling and make sure the cost will suffice for the project and complete within budget.
Project Quality Management	Used to determine the quality policies, quality assurances that was accepted during the beginning of the project and make sure they are delivered.
Project Human Resource Management	Used to manage the project team

Project Communication Management	Used to make sure that proper communication of project information takes place.
Project Risk Management	Involved in managing the risks of the project and provide risk management planning, identification, implementation and monitoring.
Project Procurement Management	Required to purchase products, services from outside the project team in order to complete the required work.
Project Stakeholder Management	Deals with the different stakeholders

**The 10 knowledge areas as defined by Project Management Institute and the Process groups**

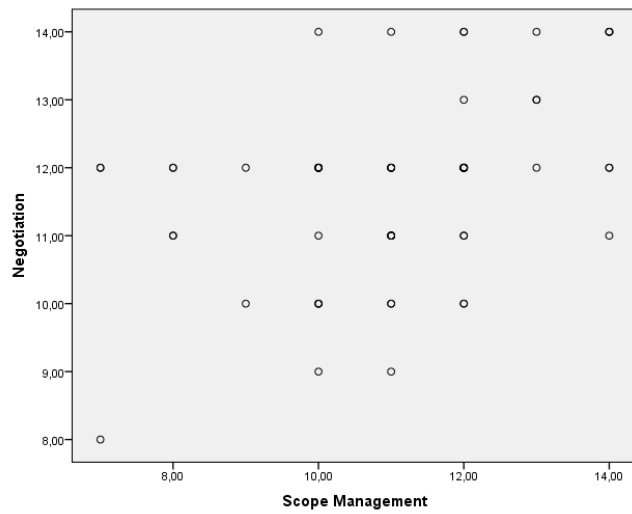
Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
<b>4. Project Integration Management</b>	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
<b>5. Project Scope Management</b>		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
<b>6. Project Time Management</b>		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
<b>7. Project Cost Management</b>		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
<b>8. Project Quality Management</b>		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
<b>9. Project Human Resource Management</b>		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
<b>10. Project Communications Management</b>		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
<b>11. Project Risk Management</b>		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
<b>12. Project Procurement Management</b>		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
<b>13. Project Stakeholder Management</b>	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

**Table 3-1.** Project Management Process Group and Knowledge Area Mapping

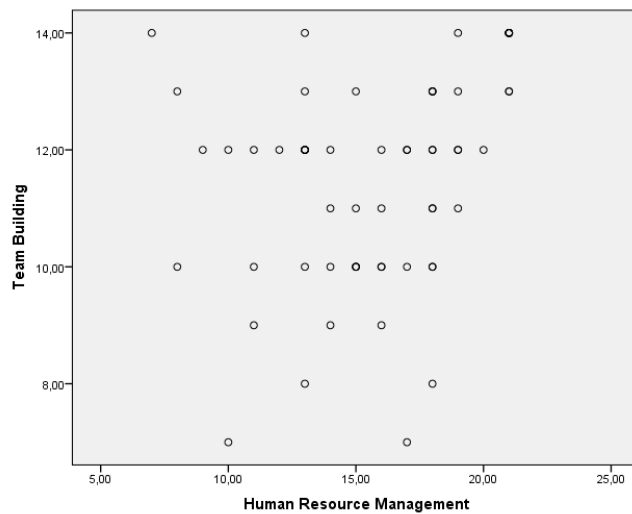
*A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition.* ©2013 Project Management Institute, Inc. All rights reserved.

## Scatterplots for multiple regression analysis

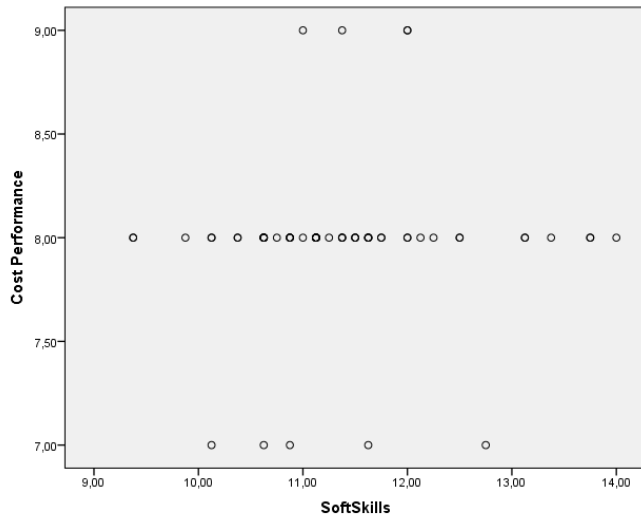
Scatterplot between scope management and negotiation



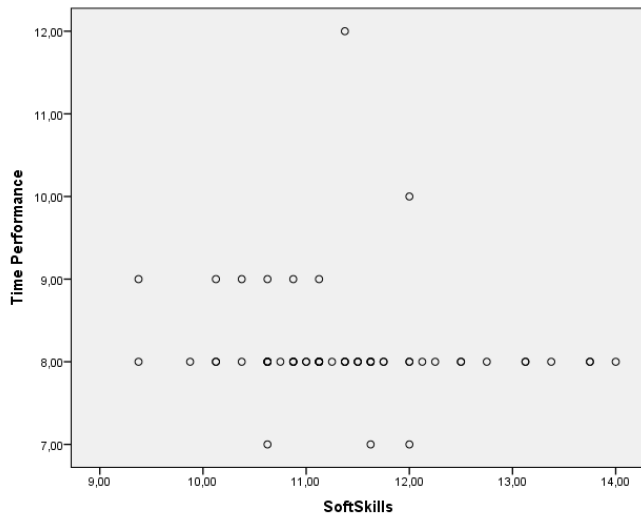
Scatterplot between human resource management and team building



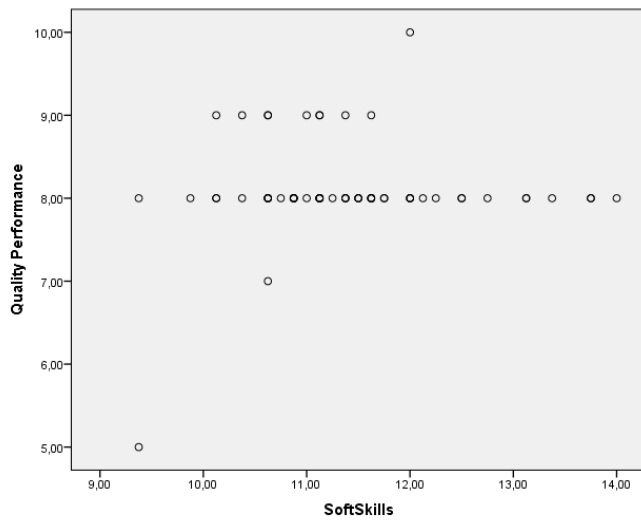
Scatterplot between soft skills and cost performance



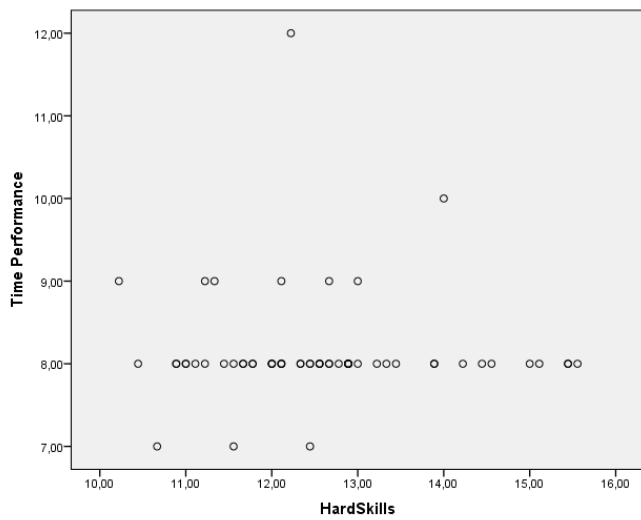
Scatterplot between soft skills and time performance



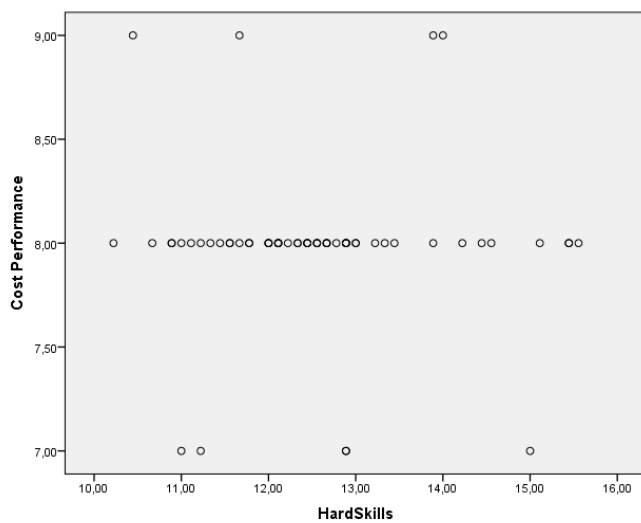
Scatterplot between soft skills and quality performance



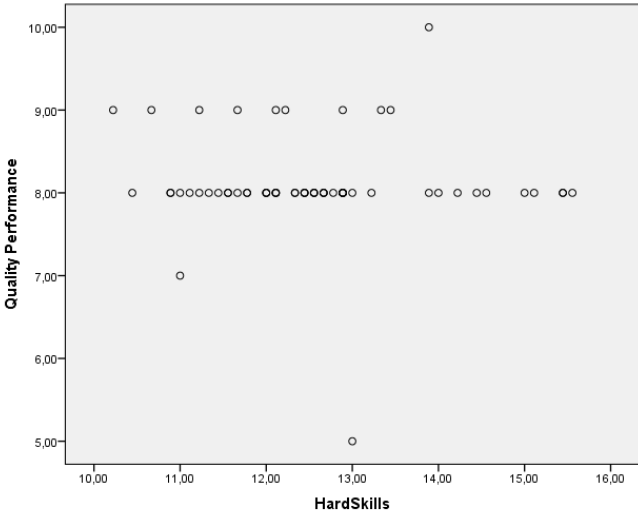
Scatterplot between hard skills and time performance



Scatterplot between hard skills and cost performance



Scatterplot between hard skills and quality performance



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