MBA Thesis

The impact of hard and soft skills on managers' innovativeness

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The author(s) declare(s) that they have completed the thesis work independently. All external sources are cited and listed under the References section. The thesis work has not been submitted in the same or similar form to any other institution(s) as part of another examination or degree.

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Abstract

Background: Competition in today's markets has made organizations focus greatly on innovative workers and managers to meet up with dynamic market demands, which forms the bedrock of human capital theory as discussed by Crăciun (2015). As part of human capital theory, managers' skills are the subject of this thesis in relation to innovation.

Objectives: To analyze the impact of hard and soft skills on manager's innovativeness, thereby addressing a real problem facing organizations. This research therefore investigates how hard and soft skills of low-level managers' impact their innovativeness by drawing inspiration from previous studies. The population for this study is limited to managers in engineering consultancy firms.

Methodology: Quantitative analysis is used for this research. Based on the research purpose and question, this study is explanatory. This study approaches theory development in a deductive way, such that hypotheses are proposed first and then data are collected to test the hypotheses. The model contains 3 constructs: Hard skills (*HS*), soft skills (*SS*) and managers' innovativeness (*MI*). Each of these constructs contain variables that are operationalized in the questionnaire. Cronbach's alpha and Exploratory Factor Analysis is used to check the reliability of each factor and validity of the constructs.

Results: Six models are analyzed with IBM SPSS Statistics 26. Quantitative tools such as Multiple regression and Spearman Rank Order Correlation was used for the analysis. The results show that there is significant and positive relationship between managers' hard and soft skills and their innovativeness.

Conclusions: The empirical analysis shows that managers' hard and soft skills are positively and significantly related to their innovativeness. This confirms the proposed hypothesis H1, H2 and H4 to be true. The result also shows that soft skills are more positively related to managers' innovativeness than hard skills. The result of this thesis show that the more hard and soft skills managers have, the more innovative they will be. One of the implications of this study is that firms should ensure that their managers possess both hard and soft skills competencies.

Recommendations for future research: Further research on this subject should ensure that larger number of responses are collected. The inability to develop a model to test for hypothesis H3 was a challenge due to the existence of multicollinearity when forming the interaction variable between hard and soft skills. This will be an interesting area for further research. In addition, using other quantitative tools other than multiple linear regression may give more significant result.

Keywords: Innovativeness, Hard skills, Soft skills, Manager, Engineering consultancy.

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List of abbreviations

CPD	Critical path diagram
EVR	Earned value reports
NPD	New product development
WBS	Work breakdown structure
HR	Human resource
VIF	Variance inflation factor

1. Introduction

Competition in today's markets has made organizations focus greatly on innovative workers and managers to meet up with dynamic market demands (Teece, 2016). This increased focus on innovative workers and managers forms the bedrock of human capital theory as discussed by Crăciun (2015, p. 45) - in which human capital is explained "as the totality of knowledge, skills, competencies and other attributes embodied in an individual". Skills which are one aspect of the human capital is the subject of this thesis in relation to innovation.

Skills are generally classified as hard or soft. While hard skills are technical skills required to carry out a particular task, soft skills on the other hand are non-technical skills that complement hard skills such as communication and interpersonal skills (Rao, 2018). Although the studies by Hendarman et al. (2018) and Hendarman et al. (2012) found that both hard and soft skills have a direct relationship with an individual's innovativeness, the authors of this thesis could not find any study that have investigated the relationship hard and soft skills have with managers innovativeness. Hence, the need for this study.

This research therefore investigates how hard and soft skills impact managers' innovativeness by drawing insights from previous studies. The models used by Hendarman et al. (2012; 2018) are further developed and used for this investigation.

1.1. Problem discussion

The sustenance of any enterprise in today's markets is dependent on its level of innovativeness (Brettel et al., 2011). This is due to the stiff competition amongst firms in virtually every industry to increase its market share. Therefore, organizations are in dire need to build innovative capabilities to keep their businesses going (Lawson et al., 2001). One aspect of innovative capabilities is the skill level of the workforce (Teece, 2016). The workforce includes both "ordinary workers" and managers, but the role of managers is very important and different from that of "ordinary workers" in the organization (Augier et al., 2009). From low-level to top-level, managers are saddled with the responsibility to ensure successful operation of the firm. Hence their level of innovativeness is very important and impacts the innovativeness of the firm more than that of "ordinary workers". Wronka-Pośpiech (2016, p. 41) stated that "personality, charisma and leadership skills of a person managing a social enterprise are the drivers of the development of such an organization". While Bloom et al. (2013) concluded that management practices impact organizational performance, Agle et al. (2006) concluded that there is a positive correlation between CEO charisma and organizational performance.

The importance of low-level, front-line managers is often neglected in organizations (Lee et al., 2013). These managers are responsible the team they manage and are considered "team-leaders" or "unit managers" (Hales, 2005, p. 479). Front-line managers "stand in a unique position which shape their followers' behaviors" (Shum et al., 2018, p. 59). Therefore, their "followers understand organizational policy and practices (Purcell and Hutchinson, 2007), service culture (Boshoff and Allen, 2000) through their direct and distal leaders" (Shum et al., 2018, p. 59). Their innovative ideas and solutions are usually less explored compared to that of medium and top-level managers, even in firms where innovation is of high priority (Hornsby et al., 2009). However, innovation function well in organizations when the path is bottom-up (Burgelman, 1983). Low-level, front-line managers work directly with "ordinary workers"; hence the need to have innovative capabilities. Therefore, the authors of this thesis chose to narrow down this investigation to low-level managers, since at their level, innovativeness is crucial to firms.

Rao (2013) explains that there are managers with high level of hard skills but lacking the necessary leadership and interpersonal skills to guide and encourage their teams to innovate. Also, there are managers with high level of soft skills but having limited technical knowledge and hard skills. These

managers usually cannot solve technical issues nor follow all conversations with colleagues and clients. This is a challenge confronting many firms.

DuBrin (2013, p. 413) defines innovation as the "creation of new ideas and their implementation or commercialization". Teece (2016, p. 211) explains that "innovation refers to creative ideas related to the generation and delivery of products and services". So, the question is: does a manager's hard and soft skills impact his or her ability to initiate and implement new ideas? Is there any correlation between managers' hard skills, soft skills and innovativeness?

Previous studies on this subject, as it relates to individuals or workers, have all come up with similar conclusions, even though their methods differ. While some of the studies collected data through surveys and performed quantitative analysis to verify their hypothesis, others did not follow this approach but rather formed conclusions through concepts and available theories. For instance, Balcar (2016) concluded that both hard and soft skills increase individual productivity, and productivity of hard skills is enhanced when used in combination with soft skills. This study did not use any empirical method to come to this conclusion. Rao (2018) was also not an empirical study but explained that "judicious blend of hard and soft skills is essential for achieving professional and leadership success" (p. 215) and that "soft skills are presentation of hard skills in the workplace" (p. 217). Since managers play a peculiar role in organizations, there is a possibility that the established relationship between hard and soft skills with individual innovativeness from Hendarman's studies may not be valid in the context of managers. Hence, the need for this study.

In addition, Hendarman et al. (2018, p. 142) explained that the "borderline between the concepts relating to hard skills and soft skills are not always clear-cut". This is because researchers have varying opinions on what skills can be classified as soft or hard. For instance, while Poisson-de et al. (2012) classified conceptual thinking as hard skills since it is more cognitive in nature, Spencer et al. (1993) classified it as soft, stating that it is more of a behavioral skill. This study discusses several types of hard and soft skills and how they relate to innovativeness. Innovativeness as a concept is also explored to understand its various aspects and why it is an important attribute for managers at all levels of the organization.

The population of this survey is limited to low-level managers in engineering consultancy firms. Innovation is the bedrock of engineering consultancy; therefore, this industry is chosen for this study. Innovativeness can take place in both technical and non-technical aspects (Van Oort et al. 2009). Therefore, technical and non-technical innovativeness are investigated and discussed in this study.

1.2. Problem formulation and purpose

This thesis builds upon the research works carried out by Hendarman et al. (2012; 2018). In these studies, individual's hard skills, soft skills and innovativeness were operationalized and used to test the proposed hypotheses. The model used in this thesis is further developed by aligning it more to suit the topic of this thesis as it relates to managers. The research question of this thesis is:

- What are the relationships between hard and soft skills, and managers' innovativeness?

The purpose of this thesis is to explain the effect hard and soft skills have on managers' innovativeness. Hard skills, soft skills and innovativeness related to managers are operationalized. Though hard skills are specific to the type of job been done, they are operationalized using generic items. Based on the operationalized variables, low-level managers are surveyed to assess their hard skills, soft skills, and innovativeness. This is used to test the proposed hypotheses and answer the research question.

1.3. Thesis structure

This thesis comprises of six chapters, bibliography and appendixes. Chapter 1 contains background and purpose of the thesis. Chapter 2 establishes the theoretical framework for hard skills, soft skills and innovativeness by doing a literature review on the subject. It consists of sub-chapters which treat the essential necessities to comprehend, study and answer the theoretical problem presented. The methodology, which serves as a foundation for this research, is explained in Chapter 3, including the different hypothesis and variables set upon the established theoretical framework. Description of different methods and techniques is made by explaining their benefits and shortcomings, and the final choices are motivated. The justifications for the transition from theoretical concepts to empirical questions and variables are explained. Results obtained through the theoretical framework and the applied methodology are presented in Chapter 4. The empirical data is presented and motivated using the theoretical framework. Descriptive statistics are depicted by tables and graphs and statistical analyses are conducted according to the theoretical framework.

In Chapter 5, the data and results are analyzed to demonstrate the relationships between hard and soft skills and managers' innovativeness using the theoretical framework. The results are discussed in relation to the theory and to what is available in previous studies. The hypotheses are also discussed. General analysis and discussions are made. Finally, conclusions of this thesis are presented in Chapter 6, where a short summary of this thesis is made prior to drawing conclusions. Also, the research question is accurately answered. Implications and contributions of this study are stated, ending with shortcomings of this study and providing some suggestions for future research.

2. Literature review

In this chapter, the authors review the literature of the themes that are related to this study which are mainly: hard skills, soft skills and innovativeness. The theoretical framework for this study, including the proposed hypotheses are also discussed in this chapter.

2.1. Innovativeness

2.1.1. Definition of innovativeness

Innovativeness makes a significant contribution to business performance and is regarded as one of the avenues to gain a competitive advantage (Tajeddini et al., 2014, p. 62). Tajeddini et al. (2006, p. 64) defined innovativeness as "the willingness and ability to adopt new technologies, processes and ideas and offer new, unique products and services before most competitors."

Innovation is considered to be an important factor to the development of enterprises and their improved competitive advantage (Wronka-Pośpiech, 2016). This research is focused on managers' innovativeness, which is the ''engagement in innovative behaviors, which includes behaviors related to the innovation process…'' (Parzefall et al. 2008, p. 166). "Innovation is based on the feelings of desire and anger" (Hammershøj, 2017, p. 115). Therefore, an innovative person should have a strong desire to convert his/her ideas into reality while combating the resistance against innovation. This study is aimed at detecting and clarifying the characteristic of an innovative person, what drives him/her and how hard and soft skills support innovation.

Rapid innovation can affect any type of industry and companies should be able to adapt quickly to the demands from customers in order to continue being a player in the market. There are many types of innovation since it can be a process, service and/or a product, which are essential for the improvement of any organization at all levels. To innovate, there must be an established innovation strategy within an organization, which allows putting into practice creative ideas, and selecting and implementing them as whole new developments or innovative improvements of existing processes, services or products (Oke, 2007). This strategy works in favor of innovative leaders.

2.1.2. Innovative aspects of leaders

An innovative leader "creates an environment of change and growth" when pursuing innovation (DuBrin, 2013, p. 436). To make this happen, it is essential to be willing to invest time and resources, take the necessary risks, and also being able to transmit the advantages and disadvantages of doing it, while encouraging the rest of the organization to innovate. As stated by Teece (2016, p. 209), "a key role of entrepreneurial managers is to permit experimentation and search, then support promising paths and close down foolish ones" by having skills as creative vision, hypothesis creation and validation, wily pragmatism and sensitive people skills.

DuBrin (2013, p. 438) also remarks that "most innovations stem from networks", thus it is clear that promoting collaboration between employees increases the innovativeness of any work group. Through hard and soft skills, an innovative leader permanently looks for innovation, nevertheless it is not always necessary to innovate since every company has its own objectives and work procedures and these companies could function well without innovation for long periods. For instance, in case of developing new products or services, the market and customers are not always willing to accept and absorb them. Therefore, each innovation has its right time to be created, released and used.

To a certain degree, innovative leaders provide employees freedom to test ideas by investing time and resources, knowing that most of the new intended innovations for work procedures, products and

services are discarded before a successful one is approved. To obtain organizational innovation, "individual willingness is essential" (Shanker et al., 2017, p. 73).

For any innovation to be developed, it is essential that Research & Development processes can operate at the same time with production process within an organization, without affecting the regular demand from clients. It is the duty of innovative leaders to consider both processes, adjusting the time and resources of the enterprise, and allowing them to function together without negatively affecting each other. The innovative leader should also be prepared to assume and acknowledge failed innovations, since they can be relevant to develop new concepts and ideas, based on what did not work and what was expected to be considered a success. It is important that this mindset is transmitted to all personnel involved with the process of innovation.

2.1.3. Technical and non-technical innovativeness

Innovativeness can take place in technical and non-technical positions. Hendarman (2012) considers technical innovativeness to be related to product and services while non-technical innovativeness to be related to organization and marketing. Individual innovativeness affects individual job performance and can be a result related to innovation. A technical innovative worker can develop "processes, procedures, tools and techniques" (Azim et al. 2010, p. 392) by mainly using hard skills. A non-technical innovative worker can develop management, organization, and services (Van Oort et al. 2009) by mainly using soft skills. Nevertheless, hard and soft skills must function together and interrelated to obtain both technical innovativeness and non-technical innovativeness. Hendarman (2012, p. 42) concluded that "information seeking soft skills positively influenced technical innovativeness and only hard skills positively influenced non-technical innovativeness".

Hard skills for innovation can be classified into ''subject-based skills'' and ''thinking and creativity'' (Scott et al., 2014, pp. 77–78) which can lead to technical innovativeness and the same time support the creation of non-technical innovativeness. Soft skills for innovation are listed in Section 2.3 (Martino et al., 2011). Carmeli et al. (2010) discusses the leadership skill called innovation leadership. This skill is prevalent to workers with innovation talents who can encourage and manage the innovation processes, thereby leading the rest of the team.

2.2. Hard skills

2.2.1. Definition of hard skills

Hard skills are technical skills needed to carry out a task (Rainsbury et al., 2002). These skills are usually developed through formal and informal education and are influenced by an individual's cognitive abilities and intelligence quotient (Page et al., 1993). Even though soft skills are becoming more important in organizations, hard skills are still very essential. Hard skills raise the confidence of managers and enhances their ability to influence their team. Ramsoomair et al. (2004, p. 232) explain that "it is reasonable to expect supervisors and line managers to have a technical comprehension of the work that they manage". While Poisson-de et al. (2012) believe that technical and conceptual skills are essential for managers, Rao (2018, p. 217) explains that "there are three skills essential for leaders at all levels – technical skills, human skills and conceptual skills". Rao (2013, p. 4) explains that the need for hard and soft skills varies depending on the level of management, stating that "Entry-level leaders need lots of hard skills. Middle-level leaders need equal amounts of hard and soft skills. For top-level managers, soft skills are more important than hard ones".

2.2.2. Perspectives of hard skills

Several theoretical views of hard skills have been developed by various researchers. Marando (2012) looked into hard skills from the perspective of project management. The study explains that hard skills of project management include the ability to create deliverable tangibles such as: work breakdown

structures (WBS), project schedules, project budgets, critical path diagrams (CPD) and earned value report (EVR). Poisson-de et al. (2012) study on developing better managers opines that conceptual skills such as: "intellectual agility, vision, rationality, wisdom, insight, adaptability and a sense of mission" (p. 215), are hard skills of management.

Hard skills in relation to innovation was discussed by Scott et al. (2014). In this study, hard skills for innovation are classified into "subject-based skills" and "thinking and creativity" (pp. 77 – 78). While subject-based skills are technical skills related to a specific field, thinking and creativity falls under conceptual skills as discussed by Poisson-de et al. (2012). The model of hard skills used in Hendarman (2018) is developed based on this reasoning. Subject-based skills is operationalized using the ability to use tools, equipment and application related to one's job. Conceptual skills on the other hand is operationalized broadly into information seeking, conceptual thinking and quick study.

Operationalizing hard skills in this thesis for low-level, front-line managers working in engineering consultancy firms are mainly focused on subject-based skills. The idea is to determine if subject-based skills influence the innovativeness of this set of managers. The intention of this thesis is to understand if managers with more subject-based skills are more innovative compared to managers with less subject-based skills. Using Hendarman (2018) as guide, this study uses task experience, ability to use to specialized tools and application, and knowledge of technical language, to operationalize hard skills. The following sub-chapters discuss these indicators of hard skills.

2.2.2.1. Task experience

Years of experience in a task is one of the best indicators of the level of hard skills a person has acquired with respect to that job. The level of hard skills increases with years of task experience, as knowledge is acquired while on the job (Page et al., 1993). In addition, technical comprehension of any field as discussed by Ramsoomair et al. (2004) happen through years of work experience. Using Marando (2012) study for illustration, a project manager's ability to create work breakdown structures, project budgets, time schedules etc., is enhanced by the years of experience he has managing projects.

2.2.2.2. Ability to use specialized tools and applications

The ability to use specialized tools, equipment, applications and software related to any job gives an indication of the level of hard skills one has. Using project management as an example, a project manager needs to know how to use specialized project scheduling and budgeting applications such as Primavera or Microsoft Project in order to create project deliverables such as WBS and CPD.

2.2.2.3. Knowledge of technical language

Every field has a technical language associated with it. Knowledge of technical language is acquired partly through education and partly through work experience. The amount of technical language one knows has a positive correlation with the level of hard skill they possess (Ramsoomair et al., 2004). A person who is not a project manager may not understand technical terms of project management such as: WBS, CPD, EVR.

2.3. Soft skills

2.3.1. Definition of soft skills

Soft skills are interpersonal and behavioral skills which are not specific to any job function and are usually not acquired through formal education (Weber et al., 2011; Moss et al., 1996). Hendarman et al. (2018) further explained that "soft skills are largely intangible, not associated with a deliverable or a real output, and they are employed without the use of tools or templates". Soft skills can also be

described as character traits that enhances individual performance (Robles, 2012). Sarkar et al. (2020, p. 348) defined soft skills as generic skills "transferable to a wide range of tasks".

Soft skills are required in interpersonal relationships and in work environments and are essential for success of organizations (AbuJbara et al., 2018). Although hard skills are required to carry out tasks, organizations nowadays are very much interested in workers having a good level of soft skills, as its importance in workplaces is increasingly becoming obvious (Gutman et al., 2013; Robles, 2012; Cimatti, 2016). The study by Klaus (2010) shows that only 25% of job success depends on hard skills, whereas 75% depends on soft skills. In addition, the survey carried out by Aasheim et al. (2009) found that IT managers ranked soft skills higher than hard skills, as a requisite for success in IT industry. AbuJbara et al. (2018, p. 247) explain that "cultural diversity, globalization and technology are factors that influence the need for enhanced soft skills in the workplace". Due to the importance of soft skills in organizations, Ramsoomair et al. (2004, p. 231) suggests that "proper execution of corporate strategy should include provision for building strength in soft skills".

2.3.2. Perspectives of soft skills

There are several theoretical perspectives of soft skills that are investigated and discussed by different researchers. For instance, Marando (2012) discussed skills as it relates to project management and concluded that interpersonal skills such as: leadership skills, communication skills, negotiation skills, influencing skills, problem-solving skills and decision-making skills, are the most essential soft skills for project managers. Rao (2018) looked into soft skills from the perspective of leadership and listed several soft skills that are essential for leaders such as: critical thinking skills, communication skills, conceptual skills, problem-solving skills, conflict management skills, team building skills etc. Martino et al. (2011) investigated soft skills in relation to innovation and concluded that soft skills such as: passion and optimism, tolerance for uncertainty, entrepreneurial orientation, relationship building and maintenance, strategic influencing skills, communication skills and quick study, are essential for innovation. The differences and similarities between these perspectives of soft skills is due to their different focuses and purposes.

The model of soft skill developed in the study by Hendarman (2018) were based on the studies by Martino et al. (2011) and Carmeli et al. (2010), due to their focus and argument on soft skills required for innovation. Passion and optimism, tolerance for uncertainty, relationship building and maintenance, taken from Martino et al. (2011) were operationalized. Innovation leadership skills, a concept of soft skill discussed in Carmeli et al. (2010), was also operationalized.

This thesis is focused on the innovativeness of low-level, front-line managers. These set of managers are also leaders in their own sphere (Teece, 2016). Management, leadership and innovation are the perspectives to be considered in building a model of soft skills for this thesis, taking into account the context of low-level managers. Based on Marando (2012), Rao (2018), Martino et al. (2011) and Hendarman et al. (2018), communication skills, interpersonal skills, strategic influencing skills and problem-solving skills are operationalized to develop the model of soft skill for this study. The limitation to four skills is to keep the model simple but suitable for this study. The following sub-chapters discuss the soft skills to be operationalized.

2.3.2.1. Communication skills

Communication is important at all levels of the organization (Ramsoomair et al., 2004). The ability to communicate effectively, both verbally and non-verbally is crucial for effective leadership (DuBrin, 2013). Poor communication skills can lead to misunderstanding and conflicts. This skill helps individuals know when, how and what to communicate. Through good communication skills, managers can create an environment within his or her team that encourages creativity and innovation.

2.3.2.2. Interpersonal skills

Interpersonal skill can also be referred to as relationship building skill. This skill enhances the ability to work and build relationship with people. With increasing globalization and cultural diversity in workplaces, interpersonal skills become even more important (DuBrin, 2013). Through interpersonal skills, workers in an organization build synergy that enhances organizational performance. Interpersonal skills include being patient, empathetic, personable and having self-control and a sense of humor (Robles, 2012). Managers with interpersonal skills build confidence and synergy with their team.

2.3.2.3. Strategic influencing skills

Although strategic influencing skills is somewhat similar to interpersonal skills, it goes further than just been personable, to been able to exert influence on people. Strategic influencing can also be said to be leadership skills, since the purpose of leadership is to influence people (DuBrin, 2013). Innovative and strategic ideas need to be sold out within an organization through communication and influencing skills. Successful leaders are masterful in the art of influencing.

2.3.2.4. Problem solving skills

The ability to solve problems quickly and appropriately is an important soft skill useful to organizations. Problems ranging from internal conflicts within an organization or a team, to external conflicts with customers and other stakeholders need to be solved appropriately. Marando (2012) listed problem solving as one of the soft skills required by project managers. Problem solving also involves having a good sense of judgement as well as been decisive (DuBrin, 2013). Analytical and critical thinking skills as noted by Rao (2018) are part of problem-solving skill.

2.4. Theoretical framework and hypothesis

Several studies have found that there is a direct correlation between soft skills and individual performance in workplace (Heckman et al., 2006; Balcar, 2016; Hendarman et al., 2018). People are usually educated in specific areas, for instance, science and literature, while the interpersonal and leadership skills are not included in regular education. It is essential that low-level managers acquire soft skills, since they are as important as hard skills. The paper by Crosbie (2005) highlights the importance of soft skills development for leaders - explaining that soft skills can be learnt, though it usually takes more time than hard skills. Low-level, front-line managers are leaders of the team they manage. Hence, they should invest time in developing soft skills that are essential for leaders and managers.

To have hard and soft skills is highly important for professional life, but to blend both skills is essential for successful managers and leaders. As indicated by Rao (2013), the lack of a good combination of hard and soft skills, is even more detrimental in management than at any other discipline. Rao also refers to real cases in history, as Steve Job's career, where the lack of soft skills was the main reason for a bad management.

The article from Heckman et al. (2006) explained that cognitive and non-cognitive skills are required to obtain performance of an individual, stating that the lack of non-cognitive skills is not compensated by a "surplus of cognitive skills" (p. 4). Therefore, both cognitive and non-cognitive skills are strictly necessary for managers to compete in today's market. Cognitive and non-cognitive skills can be considered as hard and soft skills respectively, but according to Balcar (2016, p. 454) "some soft skills are more closely connected with cognitive than non-cognitive abilities (e.g. problem solving, planning and organizing or exploring and orientation in information)".

Since hard and soft skills contribute to individual performance, high levels of both and its complementarity increase productivity of an individual. This increase in managers' performance leads

to more and better innovation for the organization. To evaluate the level of hard and soft skills from an individual is difficult. While hard skills are more related to specific knowledge, soft skills are developed through our lives and thus they are long-term skills as it is related on how to act and think upon different circumstances. Therefore, it is more difficult to measure soft skills than hard skills. Rao (2013, p. 3) stated that "hard skills are mostly tangible while soft skills are mostly intangible". The conceptual model shown in Figure 1 is developed to answer the research question of this thesis.

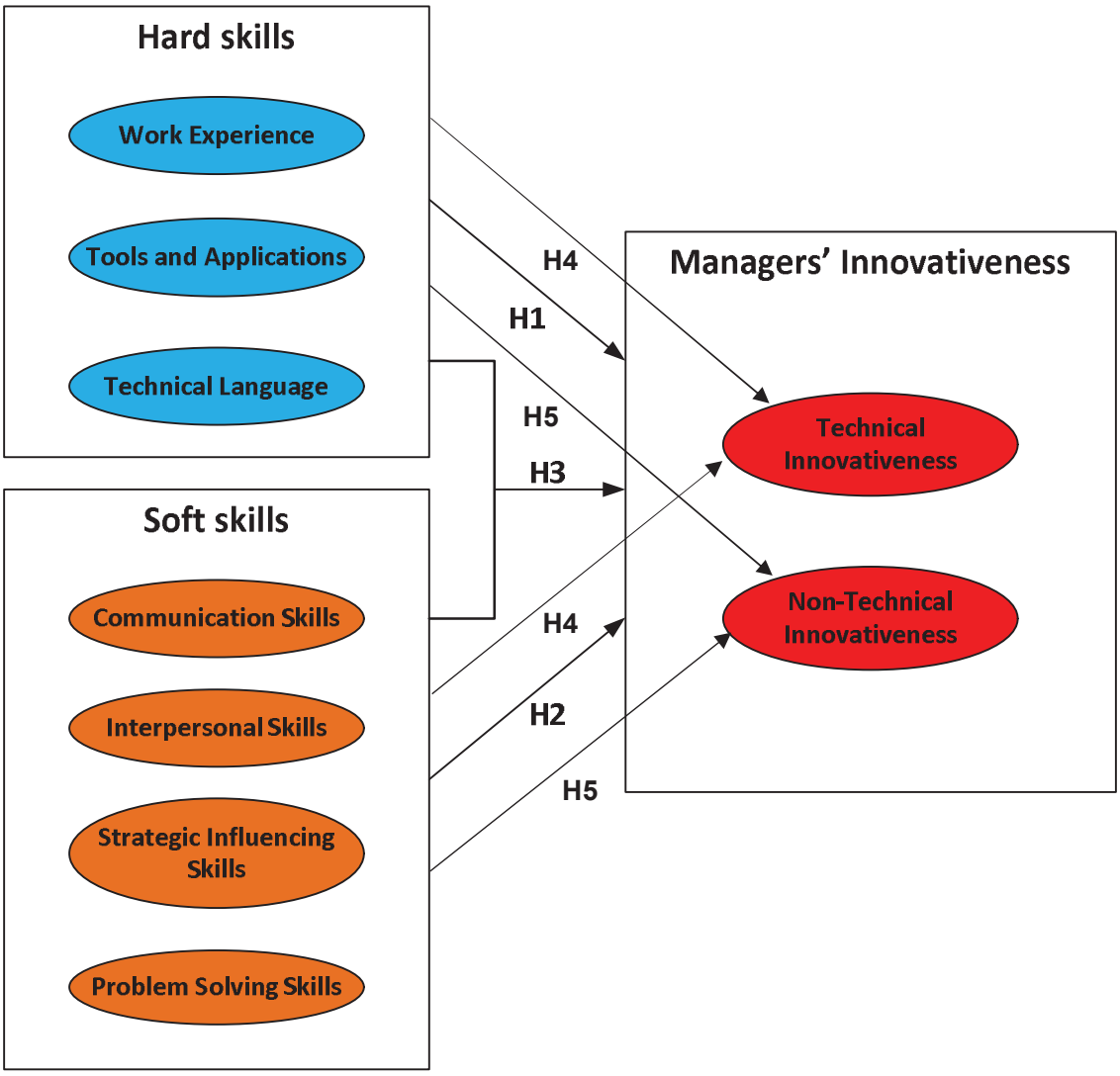

Figure 1: Conceptual model.

Based on Hendarman et al., (2012; 2018) and the conceptual model in Figure 1, the following hypotheses shall be tested:

- H1: Hard skills are positively associated with managers' innovativeness.
- H2: Soft skills are positively associated with managers' innovativeness.
- H3: The interaction between hard skills and soft skills is positively associated with managers' innovativeness.
- H4: Hard and soft skills are positively associated with managers' technical innovativeness.
- H5: Hard and soft skills are positively associated with managers' non-technical innovativeness.

3. Methodology

This chapter layouts the methodology employed in carrying out this thesis. It is organized in subchapters explaining the analytical tools that are employed in the thesis in order to answer the research question.

3.1. Research design

3.1.1. Quantitative research

Quantitative research will provide accurate numerical and detailed results to evaluate the relationship between hard and soft skills and managers' innovativeness. According to Saunders et al (2019, p. 568-569) qualitative analysis data "are likely to be more varied, elastic and complex than quantitative data" and related with "interpretivist philosophy" rather than the "meanings derived from numbers" as in quantitative analysis. In addition, this study tests the need of both hard and soft skills, finding quantitative results to explain how they have an impact in managers' innovativeness. Therefore, the research approach is quantitative. Furthermore, Saunders et al. (2019, p. 186) states that "research can be designed to fulfil either an exploratory, descriptive, explanatory or evaluative purpose, or some combination of these". Based on the research purpose and question, this study is explanatory.

3.1.2. Research methods and motivation

This study approaches theory development in a *deductive* way, such that hypotheses are proposed first with guidance from previous studies and then data are collected to test the hypotheses. Since this study is mainly focused on determining relationships between variables, primary data shall be collected in numerical and standardized form and analyzed using *statistical* techniques. This implies that quantitative research method is used in this study. *Survey* research strategy is deployed in this study since this strategy is "usually associated with *deductive* research approach" (Saunders et al., 2019, p. 193). Also, this strategy is most suitable for quantitative research method. *Mono method quantitative* study is used in this research, since single data collection technique (*questionnaires*) was used. Although Bryman et al. (2001) advocates the use of multiple methods for data collection, this study deployed only *questionnaires*. This is due to limited time and resources available for this study, as well as difficulty in getting access to deploy other quantitative data collection techniques such as structured observation or semi-structured interviews.

Regarding time horizon, this study is *cross-sectional*. This is because the research questions and objectives require data to be collected at a particular time in order to understand the relationship between variables. Furthermore, this study is based on *positivism* research philosophy. This is because it aims at addressing a common problem many organizations are facing. The study determines causal explanations. Also, the researchers are objective, to avoid any personal bias, as data were collected through structured *questionnaires* and analyzed using quantitative methods. The choices made in designing this research are put together into a "research onion" as shown in Figure 2 (Saunders et al., 2019, p. 130). This research onion gives a pictorial understanding of the process of this research design by placing each stage into layers from the first step (outer layer) to the last step (inner layer).

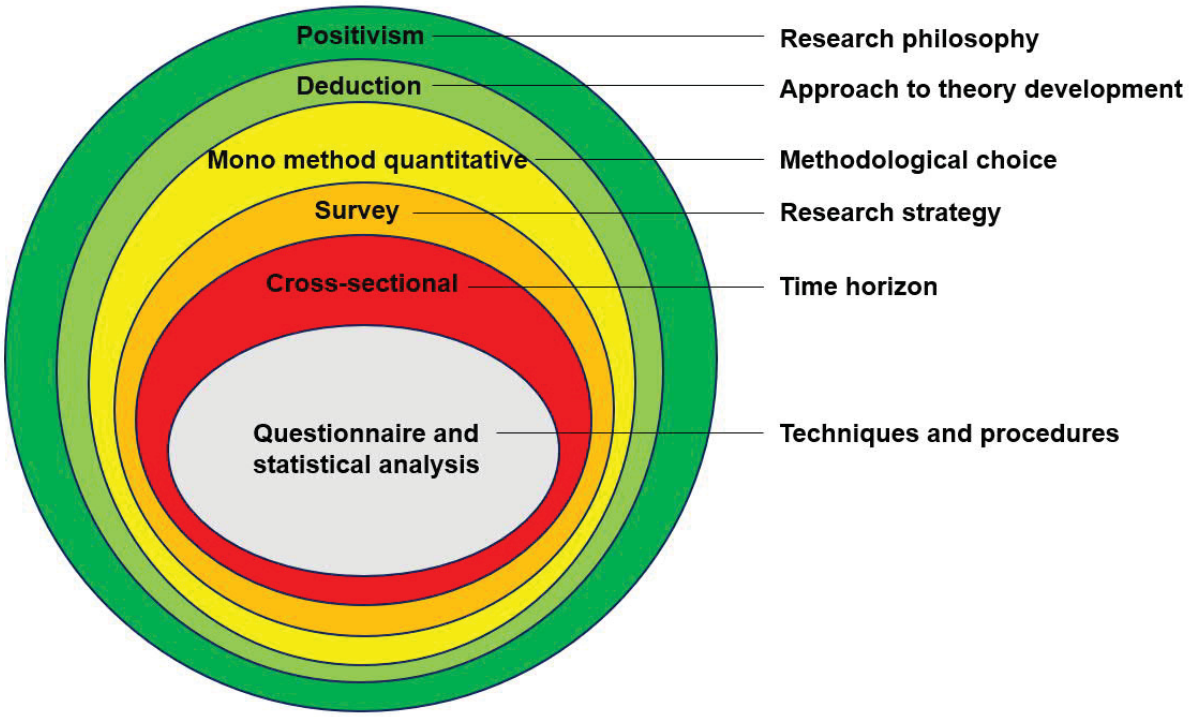

Figure 2: The research onion.

3.2. Operationalization of variables and survey design

The conceptual model in Figure 1 indicates how the theoretical framework transits to empirical variables. The model contains 3 constructs: Hard skills (*HS*), soft skills (*SS*) and managers' innovativeness (*MI*). Each of these constructs contain variables that are operationalized in the questionnaire.

The survey is designed following the design used in Hendarman et al. (2018) as a guide. The three constructs are measured at the individual respondent level using a five-point Likert scale (Allen et al., 2007; Krosnick et al., 2009). The scale ranges from ''1: Strongly disagree'', ''2: Disagree'', ''3: Neutral'', ''4: Agree'' and ''5: Strongly agree'' (Boone et al., 2012). The respondents are low-level, front-line managers working in engineering consultancy firms and the survey collect their level of hard skills, soft skills and innovativeness. The responses received are analyzed statistically - to test the hypotheses and answer the research questions.

As discussed in the theory chapter, hard skills are operationalized into three variables which are good indicators for measuring the level of hard skills one has in a particular profession. These variables are: task experience (*TE*), ability to use tools and applications (*TA*) and knowledge of technical language (*TL*). The geometric mean of these variables gives the measure of hard skills.

The most essential soft skills for low-level, front-line managers are explained in the theory chapter. The soft skills are: communication skills (*CS*), interpersonal skills (*IS*), strategic influencing skills (*SIS*) and problem-solving skills (*PSS*). These soft skills are operationalized, and the geometric mean is used to measure the level of soft skills a manager has.

Innovativeness is categorized into technical and non-technical, as discussed in the theory chapter. These two categories are deployed as factors of managers' innovativeness in the survey: technical innovativeness (*TI*) and non-technical innovativeness (*nTI*). Each of these factors are calculated using two variables each: *TI1*, *TI2*, *nTI1* and *nTI2*. The geometric mean of these two variables is used to

measure each of the factor and the geometric mean of the factor gives a measure of the managers' innovativeness.

In this study, hard and soft skills are the independent variables, while managers' innovativeness is the dependent variable. This is because the study aims at explaining the relationship hard and soft skills have on managers' innovativeness. Table 1 explains the operationalization of these variables in the questionnaire.

Table 1: Operationalization of dependent and independent variables.

Construct	Variable	Item	Operationalization
HS	*HS*	*TE*	Managers' perception of the amount of experience they have of the tasks carried out at the department they are managing.
		TA	Managers' perception of their ability to use tools and applications that are used at the department he or she is managing.
		TL	Managers' perception of their ability to understand technical language and terms used at the department they are managing.
SS	*SS*	*CS*	Managers' perception of how effective they communicate with their team and other stakeholders.
		IS	Managers' perception of how effective they are in building professional relationship with members of their team and other stakeholders.
		SIS	Managers' perception of how effective they are in strategically influencing their team.
		PSS	Managers' perception of their ability to analyze and solve problems effectively.
MI	*TI*	*TI1*	Managers' perception of how effective they have been in initiating and implementing product or service development within the department they manage and in the workplace in general.
		TI2	Managers' perception of how effective they have been in initiating and implementing product or service improvement within the department they manage and in the workplace in general.
	nTI	*nTI1*	Managers' perception of how effective they have been in initiating and implementing organizational improvements within the department they manage and in the workplace in general.
		nTI2	Managers' perception of how effective they have been in initiating and implementing innovative strategies within the department they manage and in the workplace in general.

In addition to the independent and dependent variables, control variables are also introduced to improve the robustness of the result. The control variables are respondent's demographics and are used together with multiple regression analysis (Shanker et al., 2017, p. 72). The control variables are applied so that its effect on the relationship between hard and soft skills and managers' innovativeness is controlled. The control variables are classified into individual and firm variable. The individual variables are: Age (*A*), years in management position (*MP*), Gender (*G*), level of education (*E*). Size of the firm (*F*) is the only firm variable deployed in the questionnaire. Table 2 explains how these variables are deployed in the questionnaire. The control variables are measured and analyzed as ordinal data.

Table 2: Control variables.

Classification	Variables	Questionnaire
Individual level	*A*	Age: 1 20-30 years 2 31-40 years 3 41-50 years 4 51-60 years 5 above 60 years
	MP	Years in management position: 1 0-5 years 2 6-10 years 3 11-15 years 4 16-20 years 5 above 20 years
	G	Gender: 1 Male 2 Female
	E	Educational level: 1 Senior high school 2 Bachelor's degree 3 Master's degree 4 PhD
Firm level	*F*	Firm size: 1 Small firm (1-50 employees) 2 Medium firm (51-200 employees) 3 Large firm (more than 200 employees)

3.3. Data collection

As previously stated, questionnaires are used for data collection in the research design. A "descriptive survey" (Ghauri & Grønhaug, 2010, p. 119) is chosen to gather information on a specific subject such as managers' innovativeness. Literature review of previous studies is relevant to determine the type of questions to be included in the questionnaire. The objective of the questionnaire is to get data from low-level managers within engineering consultancy firms and understand how hard and soft skills impact their innovativeness.

3.3.1. The population

Based on the purpose of this study, the research question and the survey design, the population of this survey is limited to low-level managers (Teece, 2015) who are overseeing a team or department in engineering consultancy firms. Therefore, the questionnaires were sent to active low-level, front-line managers in consultancy engineering firms across Europe. 22 companies were selected to answer the questionnaire mainly from Denmark and Sweden, but also from Spain. In addition, it was also sent to HR departments of theses engineering consultancy firms to reach out their low-level managers. Due to the situation of confinement from Covid-19, no responses from the HR departments were received. The collection period was carried out in three weeks and during this time, the questionnaire was sent to 133 managers but only 40 responses were received, giving a response rate of about 30 percent. The low response rate could also be attributed to the sensitive nature of the questions.

3.3.2. Implementation of questionnaire

The survey was implemented using online questionnaires with the help of Google online Form, which is shown in Appendix 8.1. The questionnaire consist of 17 closed-ended questions and the five-point Likert scale is used to answer the questions. The questionnaires were distributed via a hyperlink contained in email to respondents. The authors sent the hyperlink to the network of low-level managers they know working in different countries. Due to limited time in completing this research, three weeks were provided for the questionnaires to be answered and weekly reminders were sent out. The questionnaire contains three sections. The first section contains a short description of the purpose of the questionnaire. It also includes statement of confidentiality and anonymity of the survey (Saunders et al., 2019). The second section contains information on the demography of the respondents such as age, sex, country of residence, education level, years in management position and firm size, while the third section contains the closed-ended questions regarding hard skills, soft skills and managerial innovativeness.

3.4. Data analysis

The data collected was scanned for error before using it for statistical analysis. IBM SPSS Statistics was used in this research for the quantitative analysis of data collected. Cronbach's alpha reliability analysis was performed to check the reliability that each factor measures the same construct (Peterson, 1994; Mitchell, 1996; Field, 2018). Exploratory factor analysis is also performed "to determine what theoretical constructs underlie a given data set and the extent to which these constructs represent the original variables" (Henson et al., 2006, p. 396). In order to understand the relationship between the variables, bivariate analysis was performed. Spearman Rank Order Correlation is chosen for this analysis because the control variables are ordinal.

Data collected contains dependent variables (*MI, TI and nTI)*, independent variables (*SS* and *HS)* and control variables (*A*, *MP*, *G*, *E* and *F)*. Although *MI*, *TI*, *nTI*, *HS* and *SS* are measured using Likert scale in the questionnaire, this study considers these variables to be continuous since they are obtained through geometric mean of their underlying items. This is in line with the approach followed by Hendarman et al. (2018). Multiple linear regression is performed to test the proposed hypotheses (H1, H2, H3, H4 and H5). There are two reasons for choosing multiple linear regression over other available methods. First, the authors aim at comparing the result of this thesis to Hendarman et al. (2018), where multiple linear regression is used. In addition, this thesis aims at understanding the relationship managers' hard and soft skills have with their innovativeness. Multiple linear regression is very suitable for testing the relationship between a continuous dependent variable and two or more continuous independent variables (Pallant, 2011). The data collected was also checked for outliers and multicollinearity, since these are some of the assumptions behind multiple linear regression. The linear regression models showing all variables for the analysis are shown in equations 1, 2 and 3.

$$MI = \beta 0 + \beta 1HSi + \beta 2SSi + \beta 3HSxSSi + BjXik + \mathcal{E} \quad (1)$$

$$TI = \beta 0 + \beta 1HSi + \beta 2SSi + \beta 3HSxSSi + BjXik + \mathcal{E} \quad (2)$$

$$nTI = \beta 0 + \beta 1HSi + \beta 2SSi + \beta 3HSxSSi + BjXik + \mathcal{E} \quad (3)$$

Where:
MI, TI and nTI are the dependent variables.
HS and *SS* are the main independent variables.
HSxSS is interaction variable between hard and soft skills (for testing H3).
β represents the coefficient of independent variables to be determined.
i represents individual manager surveyed.
X represent the vector of k control variables.
Ɛ represent the error term.

Different regression models as described in Table 3 were analyzed to get a robust result for testing the hypotheses stated in Chapter 2.

Table 3: Description of the different regression models.

Regression model	Description
Model 1	This model does not apply any control variable. Only the dependent and independent variables are included. The dependent variable is managerial innovativeness and the model is used for testing hypotheses H1 and H2.
Model 2	This model applies control variables at the individual level. Therefore, dependent, independent and individual control variables are included. The interaction variable and firm control variable are excluded. The dependent variable is managerial innovativeness and the model used for testing hypotheses H1 and H2.
Model 3	This model applies all control variables. Therefore, dependent, independent and all control variables are included. The interaction variable is excluded. The dependent variable is managerial innovativeness and the model is used for testing hypotheses H1 and H2.
Model 4	This model applies all control, dependent and independent variables. The interaction variable is also included. The dependent variable is managerial innovativeness and the model is used for testing hypothesis H3.
Model 5	This model applies all control, dependent and independent variables. The dependent variable is technical innovativeness and the model is used for testing hypothesis H4.
Model 6	This model applies all control, dependent and independent variables. The dependent variable is non-technical innovativeness and the model is used for testing hypothesis H5.

3.5. Consequences of methods selected

3.5.1. Type of research results

Results are obtained from statistical analysis of the models detailed in Table 3. Modifying the dependent variable, the output results are numerical data gathered in Multiple Regression Model Summary and Independent Variable Significance from IBM SPSS Statistics. The key output is composed by the p-value, the variance R^2 which indicates how much variance is accounted for by the regression model and the residual plots. The results also provide significance level to point out that the model has explanatory value. The type of research results allows to determine if the relation among the response and the variables in the model is statistically significant. Also, to validate if the elaborated concept model fits well the data collected. Finally, to review if the model confirms the assumptions of the analysis.

3.5.2. Validity and reliability

Validity and reliability have been considered with respect to the chosen research design and methods. Since a deductive approach to theory development is used, questions in the questionnaires are carefully chosen so that the questionnaire represents what is been measured. Also, the questions are written to avoid any ambiguity and misunderstanding to the respondents. Pilot testing with a small group was performed before the questionnaire was deployed. This is to ensure that the questions are correctly understood by respondents, thereby increasing the quality of the data collected.

With the use of close-ended questions in the questionnaires with Likert scale, the researcher bias is excluded, and the researcher should have no problems interpreting the survey result. The external validity of the research is also improved by not limiting the survey to any geographical location or type

of industry. Also, ‘logic leaps and false assumption’ as explained by Saunders et al. (2019, p. 215) is avoided in the research design.

Furthermore, online questionnaire creates a challenge to the validity and reliability of result obtained. The online questionnaire is designed such that incomplete questionnaires cannot be submitted. In addition, as discussed earlier in the data analysis section, Cronbach’s alpha is used to test the reliability of each of construct. Exploratory factor analysis is also performed to determine construct validity.

3.5.3. Ethical issues

One of the reasons for choosing online survey is to ensure that data collected is anonymous and untraceable to respondents. This is achieved by excluding respondent and company name from the questionnaire. In addition, the questionnaire is designed such that there is no traceability to the respondents’ email address.

4. Results

In this chapter, result of the survey conducted is presented, first by looking at the respondent demographics. Results of other analyses made are presented in sub-chapters. 40 responses were received, and the survey result is presented in Appendix 8.3.

4.1. Respondents' demographics

Pictorial representations of respondents' demographics are presented in Appendix 8.2. 60% of the respondents are within the age of 31 to 40. This could be because low-level managers are usually younger compared to higher level managers. Managers between the age of 41 to 50 represent 22% of the respondents. A slightly below representation are the ones from 51 to 60 years with 18%. There was no response from managers above 60 years or younger than 30 years. In addition, 80% of respondents were male while 20% were female. Respondents from Denmark and Sweden have the vast majority with 42% and 37% of the respondents respectively. Respondents in Spain are 13%, United Kingdom 5% and France 3%.

Regarding educational level, most respondents hold a master's degree (78%), while bachelor's degree follows with 12% and PhD respondents were 10% of the respondents. Years in management positions are quite fragmented, while majority of respondents (44%) have held a management position from 0 to 5 years, 29% of respondents from 6 to 10 years and 17% from 11 to 15 years. Very small representation of managers with between 16 to 20 years of management experience is collected (3%), and 7% of respondents with more than 20 years in management position. In addition, managers were asked to state the size of the firm where they work. The range include large firms with over 200 employees, which covered 67% of respondents. Small firms with 50 or less employees represent 30%, while only 3% of the respondents work in medium sized firms.

4.2. Construct reliability

The raw data collected was scanned for errors before proceeding with the analysis. The internal consistency of each construct is checked, in order to assess the reliability that each item measures the same factor. Cronbach's alpha, which is one of the most common indicators of internal consistency, is used for this assessment (Pallant, 2011). The result of Cronbach's alpha reliability estimation using SPSS is shown in Table 4.

Table 4: Cronbach's alpha estimation.

Factor	Cronbach's alpha coefficient
Hard Skills (HS)	0.793
Soft Skills (SS)	0.689
Technical Innovativeness (TI)	0.875
Non-technical Innovativeness (nTI)	0.814

Since the Cronbach's alpha estimation of each factor exceeds 0.6, it is considered that all factors fulfill the reliability threshold (Peterson, 1994).

4.3. Construct validity

Exploratory factor analysis is used "to determine what theoretical constructs underlie a given data set and the extent to which these constructs represent the original variables" (Henson & Roberts, 2006, p. 396). The questionnaire included 17 questions on HS, SS, TI and nTI. These can measure a smaller number of underlying factors. Each component has a quality score called Eigenvalue. Only components with high Eigenvalues can represent a real underlying factor.

Table 5: Initial eigenvalues.

Component	Total	% of Variance	Cumulative %
1	2,06	51,49	51,49
2	0,866	21,658	73,148
3	0,732	18,312	91,46
4	0,342	8,54	100

A high Eigenvalue are those of at least 1. Applying this rule to the previous table it measures only 1 underlying factor. The other components having low quality scores do not represent real traits underlying our 17 questions for the EFA. These components are considered scree as shown by the following line chart.

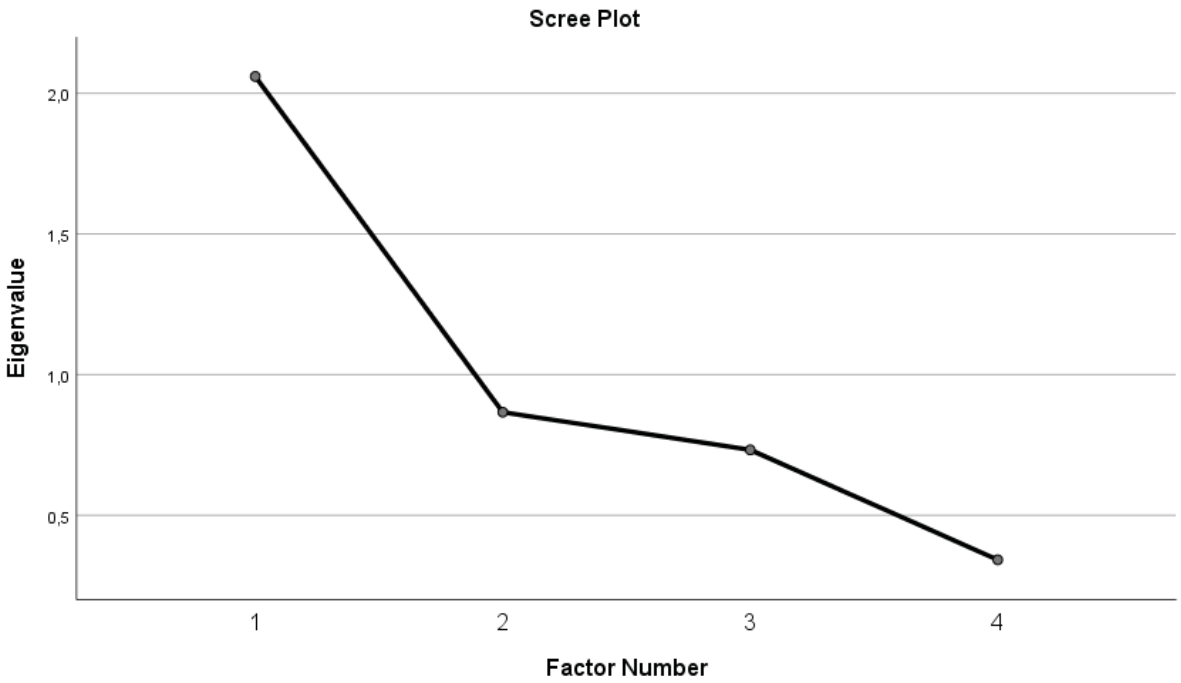

Figure 3: Scree plot of initial eigenvalues.

The steep drop between components 1 and 2 strongly suggests that only 1 factor underlie the questions. Therefore, it is investigated to what extent do our 1 underlying factor account for the variance of our 4 input variables. This is answered by the r square values which are called communalities in EFA.

Table 6: Communalities.

	Initial	Extraction
Hard Skills	1	0,337
Soft skills	1	0,451
Technical Innovativeness	1	0,787
Non-Technical Innovativeness	1	0,485

Thus, if TI is predicted from our 4 components by multiple regression, $R^2 = 0.787$ is TI's communality. Variables having communalities lower than 0.40, do not contribute much to measuring the underlying factors. Pearson correlations between the items and the component are shown in the component matrix. These correlations are defined as factor loadings.

Table 7: Component matrix.

	Component 1
Technical Innovativeness	0,887
Non-Technical Innovativeness	0,696
Soft skills	0,672
Hard Skills	0,580

Ideally, each input variable should measure precisely one factor. Fortunately, that is the case. All variables correlate with component 1. It is possible to see that Technical Innovativeness is strongly correlated to Non-technical Innovativeness, but also with soft skills and hard skills.

4.4. Quality check

Multiple linear regression is very sensitive to outliers. It is also sensitive to the existence of multicollinearity between independent variables. The existence of outliers and multicollinearity will affect the result of linear regression (Pallant, 2011; Heeringa et al., 2010). Hence, check for outliers and multicollinearity is performed to validate the result of the analyses.

4.4.1. Check for outliers

Pallant (2011, p. 159) states that "the presence of outliers can be detected from the scatterplot". Cases with a standardized residual more than 3.3 or less than -3.3 (as shown in the scatterplot) is defined to be an outlier (Tabachnick et al., 2007). The scatterplots of all models are presented in Appendix 8.4. Each scatter plot has standardized residuals within 3.3 and -3.3. Therefore, there are no outliers in the models.

4.4.2. Check for multicollinearity

The first check for multicollinearity is obtained from bivariate analysis. Since the control variables are categorical, Spearman Rank Order Correlation is performed on all variables. The correlation matrix is presented in Table 13 in Appendix 8.5. If the correlation between independent and control variables is very high (above 0.7), it indicates the presence of multicollinearity between those variables (Pallant, 2011).

From Table 13, it is seen that multicollinearity exist between the control variables: age (*A*) and years in management position (*MP*) (correlation coefficient (rho) = 0.713). This is not strange as age is likely to have a strong relationship with years in management position. Since regression analysis is very sensitive to multicollinearity (Heeringa et al., 2010), age is removed as a control variable in the regression models. Also, multicollinearity exist between hard skills (*HS*) and the interaction variable (*HSxSS*). This is because the interaction variable is obtained by multiplying *HS* and *SS* variables as discussed in Heeringa et al. (2010). Pallant (2011) notes that combining independent variables to form another independent variable will lead to multicollinearity and the regression model will give insignificant result.

Another check for multicollinearity is obtained from the variance inflation factor (VIF). If the VIF value of any variable is greater than 10, it indicates the presence of multicollinearity (Pallant, 2011). The variance inflation factors of all models are presented in Table 8 and shows that for Model 4, the VIF values are greater than 10 for variables *HS*, *SS* and *HSxSS*. This confirms that multicollinearity exist because of introduction of the interaction variable.

Table 8: Variance inflation factor of the regression models.

Variables	VIF (model 1)	VIF (model 2)	VIF (model 3)	VIF (model 4)	VIF (model 5)	VIF (model 6)
HS	1.034	1.043	1.044	150.31	1.044	1.044
SS	1.034	1.038	1.279	29.7	1.279	1.279
HSxSS	-	-	-	203.239	-	-
G	-	1.022	1.059	1.118	1.059	1.059
E	-	1.119	1.244	1.308	1.244	1.244
MP	-	1.119	1.208	1.208	1.208	1.208
F	-	-	1.574	1.574	1.574	1.574

4.5. Evaluating the models

The R Square value explains how much of the variance in the dependent variable is accounted for by the model. R square increases with the number of independent variables in the model (Pallant, 2011). Hence to compare models, Adjusted R Square data is used since it is adjusted for the number of independent variables. Table 9 shows the Adjusted R Square for each of the model and their confidence interval.

Table 9: Adjusted R Square of each model.

Model	Adjusted R Square	Confidence interval
1	0.216	99%
2	0.182	99%
3	0.159	95%
4	0.132	95%
5	0.285	99%
6	0.059	76%

The Adjusted R square values of the models are quite low – meaning that not much of the variance in the dependent variable is accounted for by the model. The probable reason for this is the small number of cases in the model (40 respondents). Table 9 also shows that with the introduction of more variables into the model, the Adjusted R square and the confidence interval are reduced.

4.6. Evaluating the regression coefficients

The regression coefficients of the independent and control variables explain the interrelationship these variables have with the dependent variables. Table 10 shows the unstandardized coefficients for each of the models and their standard errors.

Table 10: Unstandardized coefficients of each model.

Model	1	2	3	4	5	6
Hard Skills (*HS*)	0.213*** (0.112)	0.209*** (0.113)	0.209*** (0.115)	0.230 (1.397)	0.317* (0.127)	0.096 (0.136)
Soft Skills (*SS*)	0.622** (0.237)	0.628** (0.239)	0.594** (0.269)	0.614 (1.315)	0.668** (0.298)	0.514*** (0.318)
HS and SS interaction (*HSxSS*)	-	-	-	-0.005 (0.346)	-	-
Years in management position (*MP*)	-	0.022 (0.082)	0.029 (0.087)	0.032 (0.123)	0.028 (0.128)	0.009 (0.103)
Gender (*G*)	-	-0.326 (0.233)	-0.313 (0.241)	-0.314 (0.251)	-0.302 (0.269)	-0.312 (0.285)

Educational level (*E)*	-	-0.154 (0.206)	-0.174 (0.220)	-0.173 (0.229)	0.089 (0.244)	-0.416 (0.216)
Firm size (*F*)	-	-	-0.038 (0.128)	-0.038 (0.130)	-0.141 (0.149)	0.054*** (0.152)
Constant	0.331 (0.989)	0.807 (1.175)	1.076 (1.503)	0.995 (5.509)	-0.238 (1.673)	2.368 (1.782)

Standard errors in parenthesis; * 99% confidence interval, ** 95% confidence interval, *** 90% confidence interval.

From Table 10, it is seen that only coefficients of hard and soft skills in Models 1, 2 and 3 are statistically significant with hard skills having 90% confidence interval and soft skills having 95% confidence interval. Model 4 has no statistically significant coefficients, and this is because of the multicollinearity in the model due to the introduction of the interaction variable. Therefore, the result of Model 4 cannot be used for testing hypothesis H3. Models 5 and 6 show the relationship hard and soft skills have with technical and non-technical innovativeness.

5. Analysis and discussion

In this chapter, the results are discussed and analyzed in sub-chapters. The proposed hypotheses in Chapter two are also discussed.

5.1. Hard skills and managers' innovativeness

The relationship between managers' hard skills and innovativeness is shown in the correlation matrix (Table 13) with Spearman correlation coefficient = 0.389 at 95% confidence interval, implying that the relationship is positive, substantial and significant. This means that the more hard skills a manager has, the more innovative he/she will be.

The result of the regression analyses on models 1, 2 and 3 (Table 10) shows that the regression coefficient of hard skills are 0.213, 0.209 and 0.209 in the three models respectively, with 90% confidence interval. This also shows that hard skills are positively and significantly associated with managers' innovativeness.

The first hypothesis, H1 is: Hard skills are positively associated with managers' innovativeness. The result of models 1, 2 and 3 show that hypothesis H1 is true and therefore confirmed. This is consistent with previous studies, mainly Hendarman et al. (2018) in which an individuals' hard skills is confirmed to have a positive and significant association with their innovativeness.

5.2. Soft skills and managers' innovativeness

The relationship between managers' soft skills and innovativeness is shown in the correlation matrix (Table 13) with Spearman correlation coefficient = 0.421 at 99% confidence interval, implying that the relationship is positive, substantial and significant. This means that the more soft skills a manager has, the more innovative he/she will be.

The result of the regression analyses on models 1, 2 and 3 (Table 10) shows that the regression coefficient of soft skills are 0.622, 0.625 and 0.594 in the three models respectively, with 95% confidence interval. This also shows that soft skills are positively and significantly associated with managers' innovativeness.

The second hypothesis H2 is: Soft skills are positively associated with managers' innovativeness. The result of models 1, 2 and 3 show that hypothesis H2 is true and therefore confirmed. This is consistent with previous studies, mainly Hendarman et al. (2018) in which an individual's soft skills is confirmed to have a positive and significant association with their innovativeness.

5.3. Hard skills versus soft skills

The correlation matrix shows that soft skills have a stronger relationship with managers' innovativeness than hard skills. Result of the regression models also show that soft skills have a stronger association with managers' innovativeness than hard skills. These findings are also consistent with the results of Hendarman et al. (2018).

Furthermore, the correlation matrix shows that hard skills and soft skills do not have a strong relationship, with correlation coefficient of 0.153. This is expected as there is no guarantee that a person with a certain amount of hard skills will also have similar amount of soft skills. This implies that an individual's hard and soft skills are not related, and a person with high level of hard skills can have low level soft skills and vice-versa.

5.4. Interaction of hard and soft skills

The relationship between the interaction of managers' hard and soft skills and innovativeness is shown in the correlation matrix (Table 13) with Spearman correlation coefficient = 0.505 at 99% confidence interval, implying that the relationship is positive, substantial and significant. This means that the more hard and soft skills interaction a manager has, the more innovative he/she will be.

However, model 4 which was designed for testing hypothesis H3, gave regression coefficients that are insignificant. This arises because of the multicollinearity that exist in forming the interaction variable. Russel et al. (1992) found that the use of Likert scales in questionnaires are not suitable for finding interaction effects. Hendarman et al. (2018) also confirms that Likert scale is not suitable for testing interaction effects. Hence, hypothesis H3 cannot be tested with the method followed in this thesis.

5.5. Technical versus non-technical innovativeness

It can be seen from Table 10 that soft skills have a stronger relationship with managers' technical and non-technical innovativeness than hard skills. The relationship is positive, significant and substantial with regression coefficient of 0.668 at 95% confidence interval for technical innovativeness and regression coefficient of 0.514 at 90% confidence interval for non-technical innovativeness. Hard skills on the other hard have a positive, significant and substantial relationship with technical innovativeness with regression coefficient of 0.317 at 99% confidence interval. The relationship with non-technical innovativeness is neither significant nor substantial. This implies that the more hard skills a manager has, the more technical innovative he/she will be. However, the more soft skills a manager has, the more technical and non-technical innovative he/she will be.

This result is consistent with Hendarman et al. (2012) with respect to the relationship between soft skills and technical innovativeness. However, there is a contradiction with respect to the relationship between hard skills and non-technical innovativeness in which result from Hendarman et al. (2012) shows that hard skills have a strong and significant relationship with non-technical innovativeness.

Hypothesis H4 is: Hard and soft skills are positively associated with technical innovativeness. The result of model 5 shows that this hypothesis is true and therefore confirmed. Hypothesis H5 is: Hard and soft skills are positively associated with non-technical innovativeness. However, the result of model 6 shows that this hypothesis is not completely true, since hard skills did not show a significant relationship with non-technical innovativeness. This hypothesis is therefore confirmed to be partly true.

5.6. Control variables

It can be seen from Table 10 that none of the control variables have a significant association with managers' innovativeness in models 1 to 4. One reason for this could be because the sample size is small and multiple linear regression is sensitive to sample size and better suited for large sample size (Pallant, 2011). Another reason could be because linear regression was used for this analysis, whereas the control variables are ordinal. Also, the correlation matrix in Table 13 shows that the control variables do not have a significant relationship with the dependent and independent variables. However, the correlation matrix shows some interesting relationship between some control variables.

Years in management position and level of education have a correlation coefficient of -0.344 at 90% confidence interval. Though the relationship is substantial and significant, it is in the negative direction. This means that years in management position decreases with managers' higher level of education. Another interesting relationship is between the age of managers and size of firm with a correlation coefficient of 0.457 at 95% confidence interval. The relationship is positive, substantial and significant and implies that older managers are more likely to be in larger firms while younger managers are more likely to be in small firms like start-ups.

In addition, another interesting relationship is between managers' level of education and size of firm, having a correlation coefficient of -0.380 at 90% confidence interval. This relationship is negative, substantial and significant and implies that managers with lower education are more likely to be in larger firms while managers with higher education are more likely to be in smaller firms like start-ups, where innovation is the driving force.

6. Conclusions

In this chapter, the thesis is summarized, including its implications and contributions in relation to other studies. Shortcomings of this thesis are also stated and recommendations for future research are given.

6.1. Summary

This thesis investigates the impact of managers' hard and soft skills on their innovativeness. Other factors that can influence managers' innovativeness such as: size of the firm, years in management position, gender, level of education and age are also controlled in this study. The population for this study is limited to low-level managers in engineering consultancy firm, since innovation is the bedrock of engineering consultancy.

After careful review of the literature on this subject, managers' hard skills, soft skills and innovativeness are operationalized in the questionnaire. Hard skills were operationalized using factors such as: knowledge of technical language, task experience and ability to use tools and applications. Soft skills are operationalized into four factors: communication skills, problem-solving skills, strategic influencing skills and interpersonal skills. Innovativeness is broken down into technical and non-technical innovativeness. Technical innovativeness is operationalized to initiating and implementing product and service development and improvement. Non-technical innovativeness on the other hand is operationalized to initiating and implementing organizational improvement and innovative strategies. Questionnaires are sent to respondents and quantitative tools such as Spearman rank correlation and multiple linear regression are used in analyzing the data collected.

The empirical analysis shows that managers' hard and soft skills are positively and significantly related to their innovativeness. This confirms the proposed hypothesis H1 and H2 to be true. The result also shows that soft skills have a stronger relationship with managers' innovativeness than hard skills. In addition, the result also shows that managers' hard and soft skills are positively and significantly related to their technical innovativeness, thereby confirming hypothesis H4 to be true. However, hypothesis H5 is confirmed to be partly true since only managers' soft skills show to be significantly related to their non-technical innovativeness. The research question for this thesis is:

- What are the relationships between hard and soft skills and managers' innovativeness?

From the result, the answers to the research question are:

- Managers' hard skills have a positive and significant relationship with their innovativeness.
- Managers' soft skills have a positive and significant relationship with their innovativeness.
- Managers' hard and soft skills have a positive and significant relationship with their technical innovativeness.
- Managers' soft skills have a positive and significant relationship with their non-technical innovativeness.
- Managers' hard skills does not have a significant relationship with their non-technical innovativeness.

6.2. Implications

The result of this thesis show that the more hard and soft skills managers have, the more innovative they will be. This has an implication for firms. The need for innovative managers to drive organizational growth and increase efficiency of the firm cannot be over emphasized in today's markets. This is due to the stiff competition available in many industries. Managers at all levels of the organization play a very important role in initiating, supporting and implementing innovative products, processes, services and

strategies that would enhance market differentiation. Hence, the need to study managers' innovativeness is a subject of interest to many firms.

One of the implications of this study is that firms should ensure that their managers possess both hard and soft skills competencies. Investment in developing managers' hard and soft skills competencies should be prioritized in order to sustain organizational growth, increase market share and enhance profitability. In addition, this study shows that managers' soft skills have a stronger relationship with both their technical and non-technical innovativeness than hard skills. This is consistent with previous studies on this subject and implies that firms should emphasize the need for managers to develop and display high level of soft skills in the organization.

With focus on managers, the empirical result of this thesis has deepened research in the field of skills and innovation - explaining that the established relationship between hard skills, soft skills and individual innovativeness also applies to managers, with emphasis on low-level managers.

6.3. Further research

This study has some shortcomings. First, the number of responses received is not much with a response rate of about 30% of which 79% are from Denmark and Sweden alone. The quantitative methods employed are sensitive to sample size and the accuracy of the result will increase with larger sample size. Further research on this subject should ensure that larger responses are collected. Bryman et al. (2001) advocates the use of multiple methods for data collection. Getting responses from managers in other countries is recommended for further research. In addition, other levels of managers and industries can be explored, to see if there will be any difference in the result.

The inability to develop a model to test for hypothesis H3 was a challenge due to multicollinearity that exist in the formulation of the interaction variable between hard and soft skills. Hendarman et al. (2018) also faced similar problem and the result of the model was insignificant. This will be an interesting area for further research to explore how to develop the interaction variable between hard and soft skills. In addition, using multiple linear regression may not be the most optimal quantitative method to use for this analysis considering that dependent and independent variables are measured using Likert scale and the control variables are ordinal. Further research should investigate other quantitative methods that can be used for this analysis.

Empirical study on the impact of innovative managers on organizational performance is another area of research that strengthen or weaken the argument made in this thesis - that having innovative managers will improve organizational performance. Finally, the operationalization of hard skills, soft skills and managers' innovativeness in the questionnaire can be expanded to include more items that can provide deeper explanation of the relationships.

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8. Appendix

The questionnaire, respondents' demographics, survey results, scatter plots and correlation matrix are presented in subchapters.

8.1. Questionnaire

Questionnaire

* Disclosure statement: The purpose of the questionnaire is to obtain data from managers of departments and teams at engineering firms, in order to carry out a MBA Thesis at Blekinge Institute of Technology. The data gathered through this questionnaire will be used only for educational purposes. This will be achieved by excluding respondent and company names from the questionnaire. Full anonymity and confidentiality is assured for all respondents.

The questionnaire contains:

- Questions on the demography of the respondents such as age, sex and country of residence, education level, years in management position and firm size.
- 17 closed-ended questions.

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Age *

- 20-30
- 31-40
- 41-50
- 51-60
- above 60

Sex *

- Male
- Female

Country of Residence *

Your answer

Educational level *

- Senior high school
- Bachelor's degree
- Master's degree
- PhD

Years in management position *

- 0-5
- 6-10
- 11-15
- 16-20
- above 20

Firm size *

- Small firm (1-50 employees)
- Medium firm (51-200 employees)
- Large firm (more than 200 employees)

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I have years of experience in the tasks performed at the department that I am managing. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I know how to use most of the tools and application used at the department that I am managing. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I understand the technical language and terms used at the department that I am managing *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I communicate effectively with members of my team. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I communicate effectively with other stakeholders. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I am able to build professional relationship with members of my team. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I am able to build professional relationship with other stakeholders. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I influence my team in a strategic way. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I am able to analyze and solve problems effectively. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I have implemented product or service improvement within the department that I manage and in the workplace in general. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I have initiated product or service improvement within the department that I manage and in the workplace in general. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I have implemented product or service development within the department that I manage and in the workplace in general. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I have initiated product or service development within the department that I manage and in the workplace in general. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I have implemented organizational improvements within the department that I manage and in the workplace in general. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I have initiated organizational improvements within the department that I manage and in the workplace in general. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I have implemented innovative strategies within the department that I manage and in the workplace in general. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

I have initiated innovative strategies within the department that I manage and in the workplace in general. *

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly agree

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8.2. Respondents' demographics

Table 11: Respondents' demographics

Case No.	Age	Sex	Country of Residence	Education level	Years in management	Firm size
1	31-40	Female	Denmark	Master's degree	0-5	Large firm (more than 200 employees)
2	31-40	Male	Spain	Master's degree	0-5	Large firm (more than 200 employees)
3	31-40	Female	Sweden	Master's degree	0-5	Large firm (more than 200 employees)
4	31-40	Male	Denmark	PhD	0-5	Small firm (1-50 employees)
5	51-60	Male	Sweden	Bachelor's degree	11-15	Large firm (more than 200 employees)
6	31-40	Male	Sweden	Master's degree	0-5	Large firm (more than 200 employees)
7	41-50	Female	Sweden	Master's degree	6-10	Large firm (more than 200 employees)
8	31-40	Male	Denmark	Master's degree	11-15	Large firm (more than 200 employees)
9	51-60	Male	Sweden	Master's degree	6-10	Large firm (more than 200 employees)
10	31-40	Male	Sweden	Master's degree	0-5	Large firm (more than 200 employees)
11	31-40	Female	Sweden	Master's degree	6-10	Large firm (more than 200 employees)
12	51-60	Male	Sweden	Master's degree	11-15	Large firm (more than 200 employees)
13	41-50	Male	Sweden	Bachelor's degree	6-10	Large firm (more than 200 employees)
14	41-50	Female	Sweden	Master's degree	6-10	Large firm (more than 200 employees)
15	31-40	Female	Denmark	Master's degree	6-10	Small firm (1-50 employees)
16	51-60	Female	Denmark	Bachelor's degree	above 20	Large firm (more than 200 employees)
17	31-40	Male	Sweden	Master's degree	0-5	Large firm (more than 200 employees)
18	41-50	Male	Sweden	Master's degree	6-10	Large firm (more than 200 employees)
19	51-60	Male	Sweden	Master's degree	11-15	Large firm (more than 200 employees)
20	31-40	Male	Denmark	Master's degree	0-5	Small firm (1-50 employees)
21	31-40	Male	France	Bachelor's degree	6-10	Large firm (more than 200 employees)
22	51-60	Male	Denmark	Master's degree	above 20	Large firm (more than 200 employees)
23	41-50	Male	Sweden	Master's degree	0-5	Large firm (more than 200 employees)
24	31-40	Male	Spain	Master's degree	6-10	Medium firm (51-200 employees)
25	31-40	Male	Denmark	Master's degree	0-5	Small firm (1-50 employees)
26	31-40	Male	Sweden	Master's degree	0-5	Small firm (1-50 employees)
27	41-50	Male	Denmark	Master's degree	6-10	Small firm (1-50 employees)
28	31-40	Male	Denmark	PhD	0-5	Small firm (1-50 employees)
29	31-40	Male	Denmark	Master's degree	0-5	Small firm (1-50 employees)
30	31-40	Male	Denmark	Master's degree	6-10	Small firm (1-50 employees)
31	31-40	Male	Denmark	Master's degree	0-5	Large firm (more than 200 employees)
32	41-50	Female	Spain	Master's degree	11-15	Large firm (more than 200 employees)
33	41-50	Male	United Kingdom	Master's degree	above 20	Large firm (more than 200 employees)
34	31-40	Male	Denmark	PhD	0-5	Large firm (more than 200 employees)
35	31-40	Male	Spain	PhD	0-5	Small firm (1-50 employees)
36	41-50	Male	United Kingdom	Master's degree	11-15	Large firm (more than 200 employees)
37	31-40	Male	Denmark	Master's degree	11-15	Small firm (1-50 employees)
38	31-40	Male	Denmark	Master's degree	0-5	Small firm (1-50 employees)
39	31-40	Male	Spain	Bachelor's degree	0-5	Large firm (more than 200 employees)
40	51-60	Male	Denmark	Master's degree	16-20	Large firm (more than 200 employees)

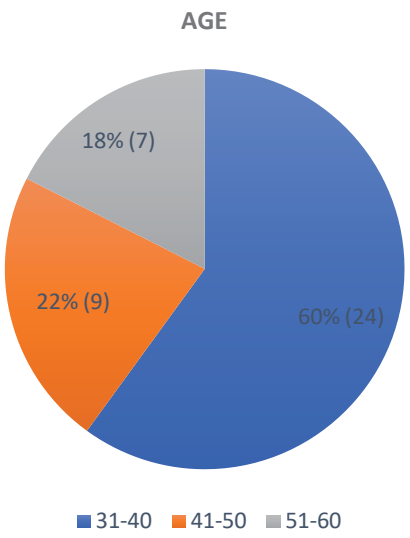

Figure 4: Age of respondents

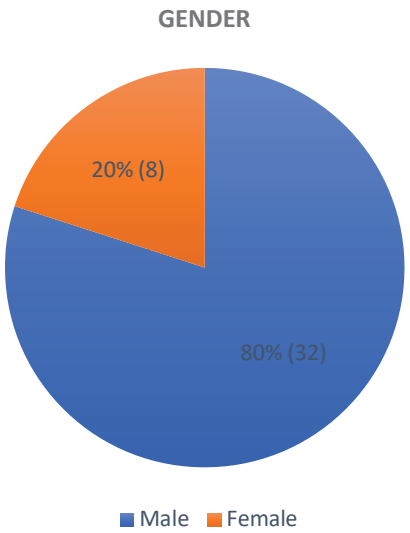

Figure 5: Gender of respondents

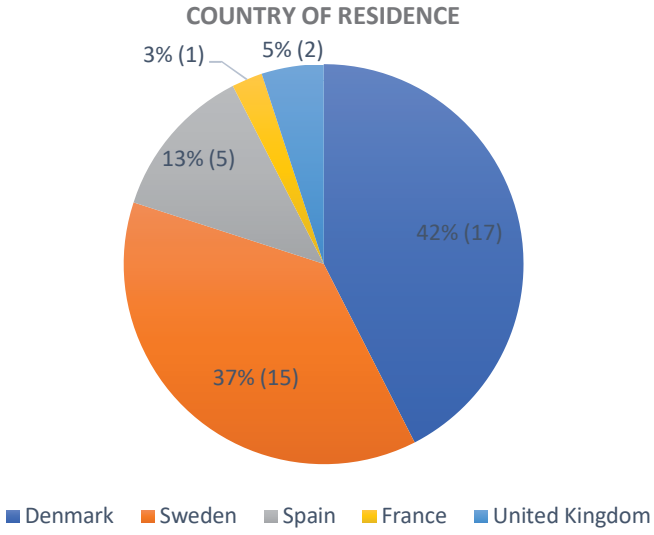

Figure 6: Country of residence of respondents.

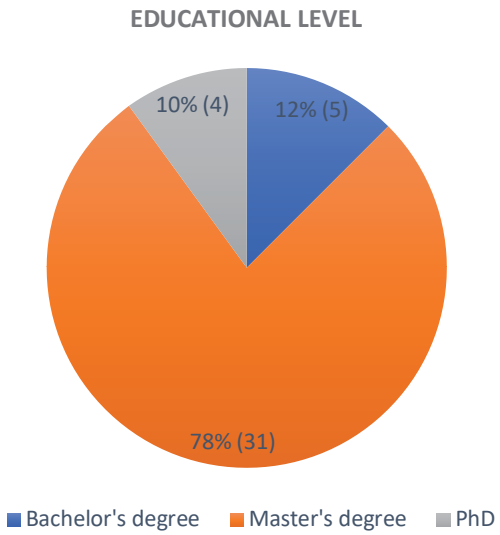

Figure 7: Educational level of respondents.

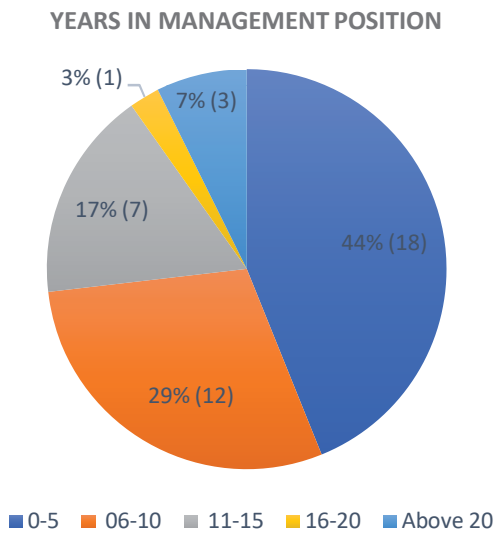

Figure 8: Years in management position of respondents.

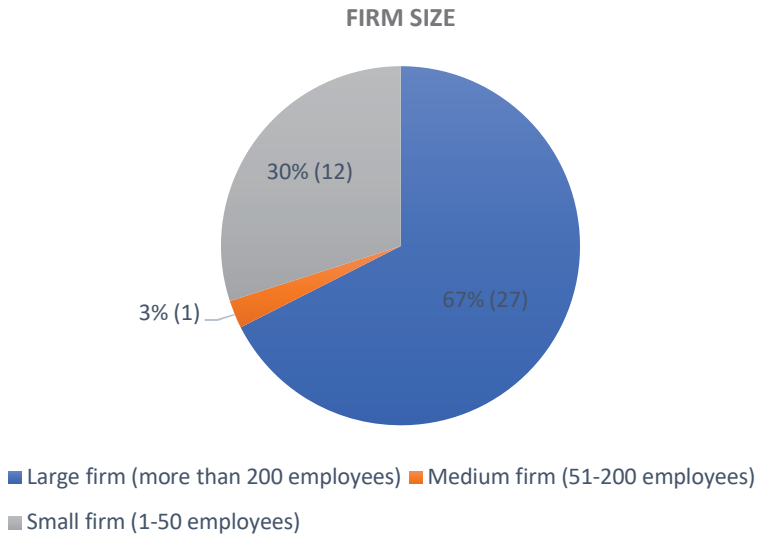

Figure 9: Size of firm where respondents work.

8.3. Survey result

The questionnaire contains 17 closed-ended questions with the Likert scale. The response to each question is shown in the figures below.

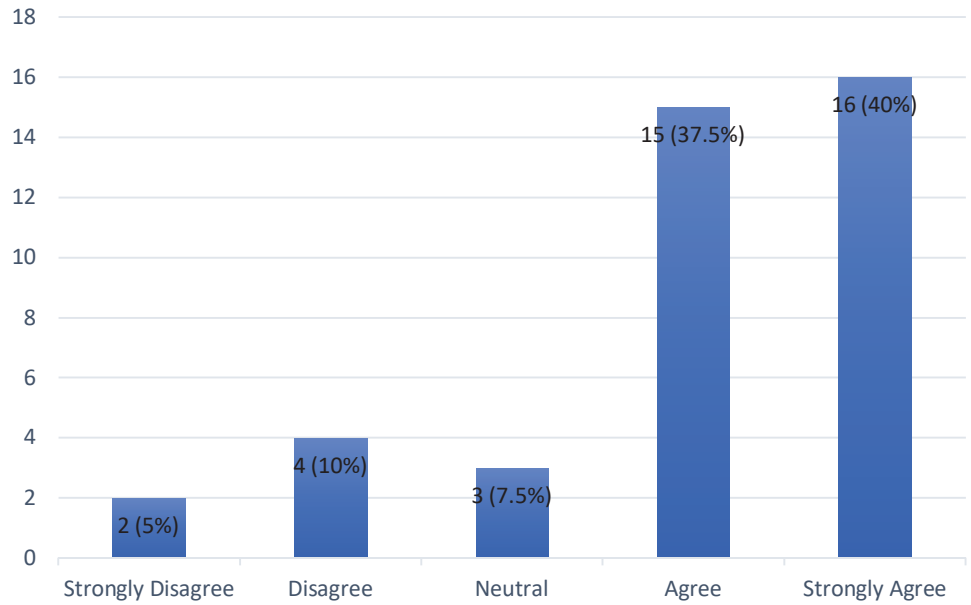

Figure 10: I have years of experience in the tasks performed at the department that I am managing.

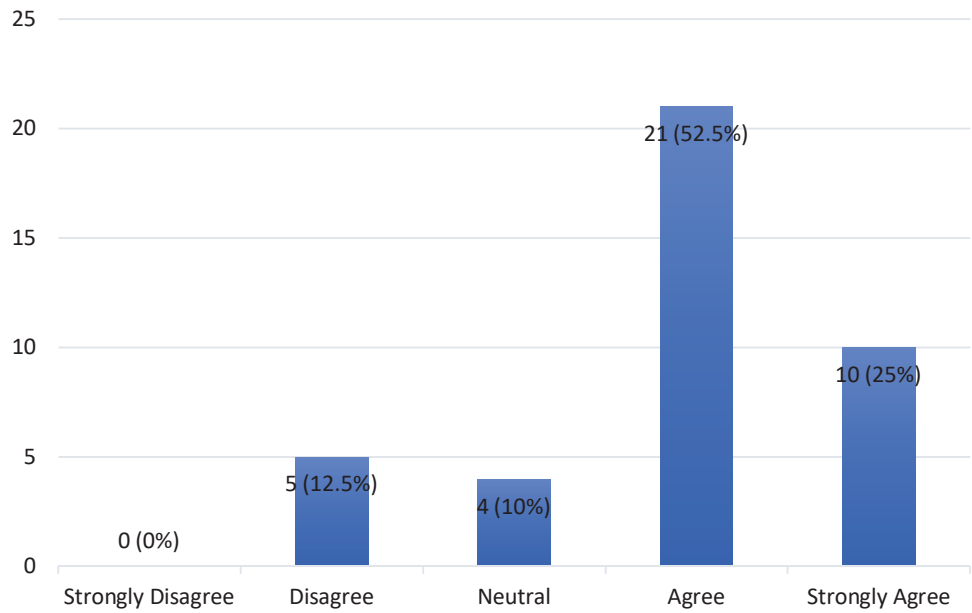

Figure 11: I know how to use most of the tools and application used at the department that I am managing.

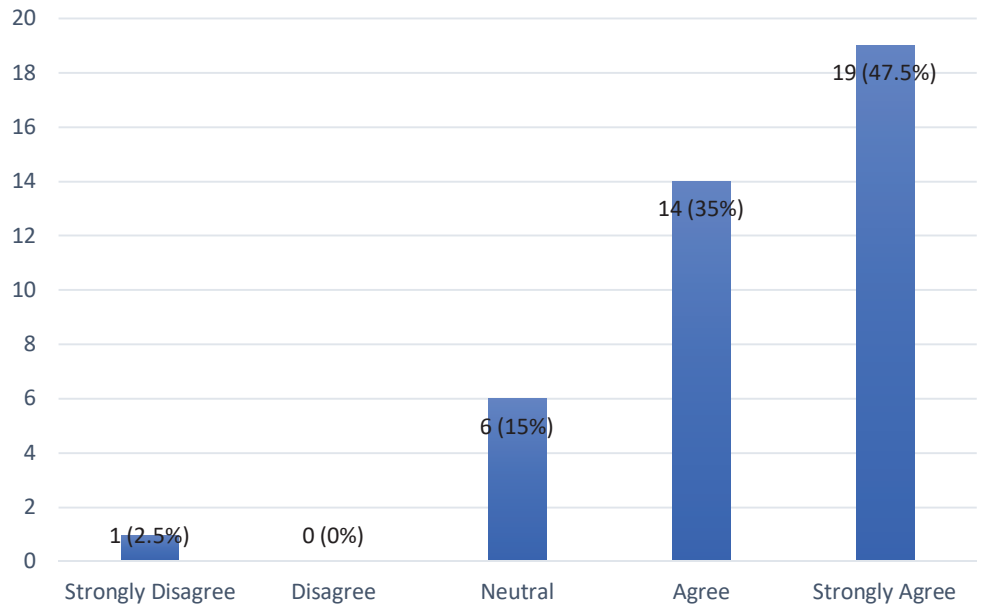

Figure 12: I understand the technical language and terms used at the department that I am managing.

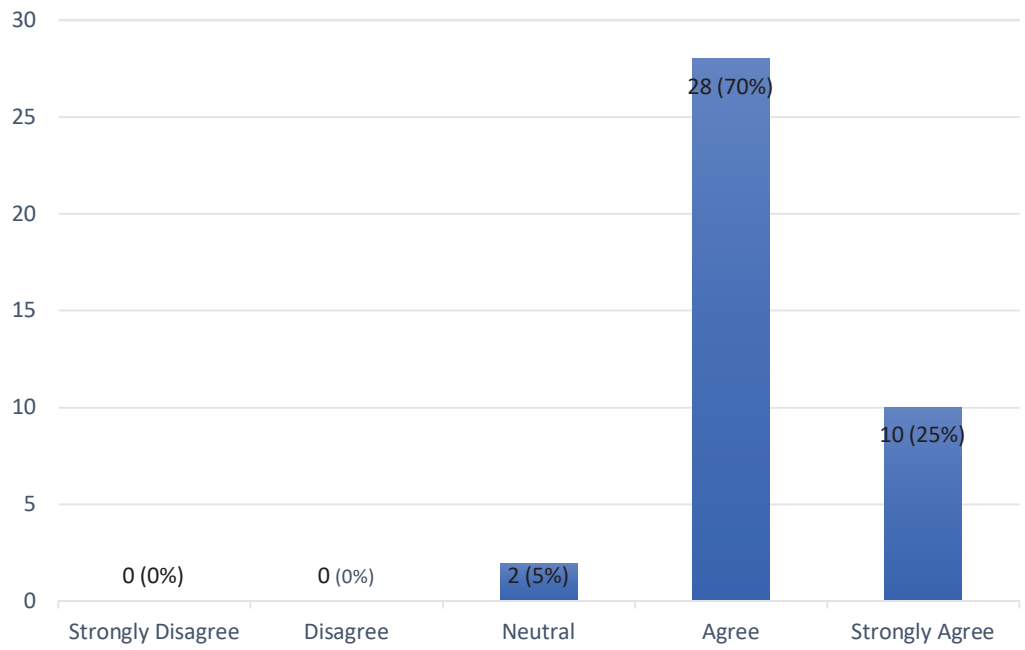

Figure 13: I communicate effectively with members of my team.

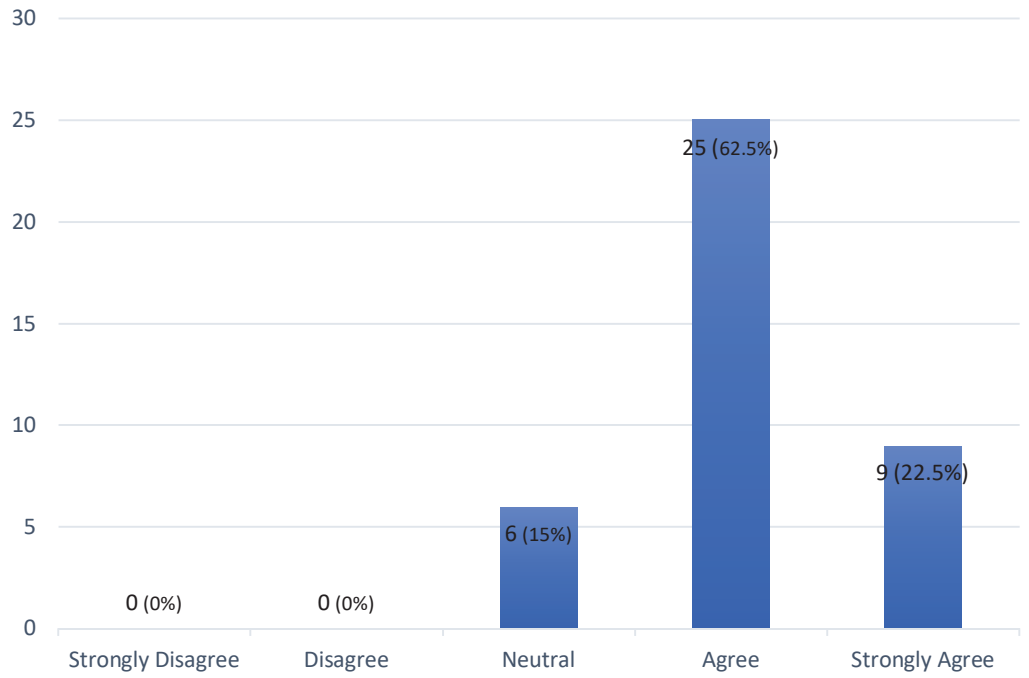

Figure 14: I communicate effectively with other stakeholders.

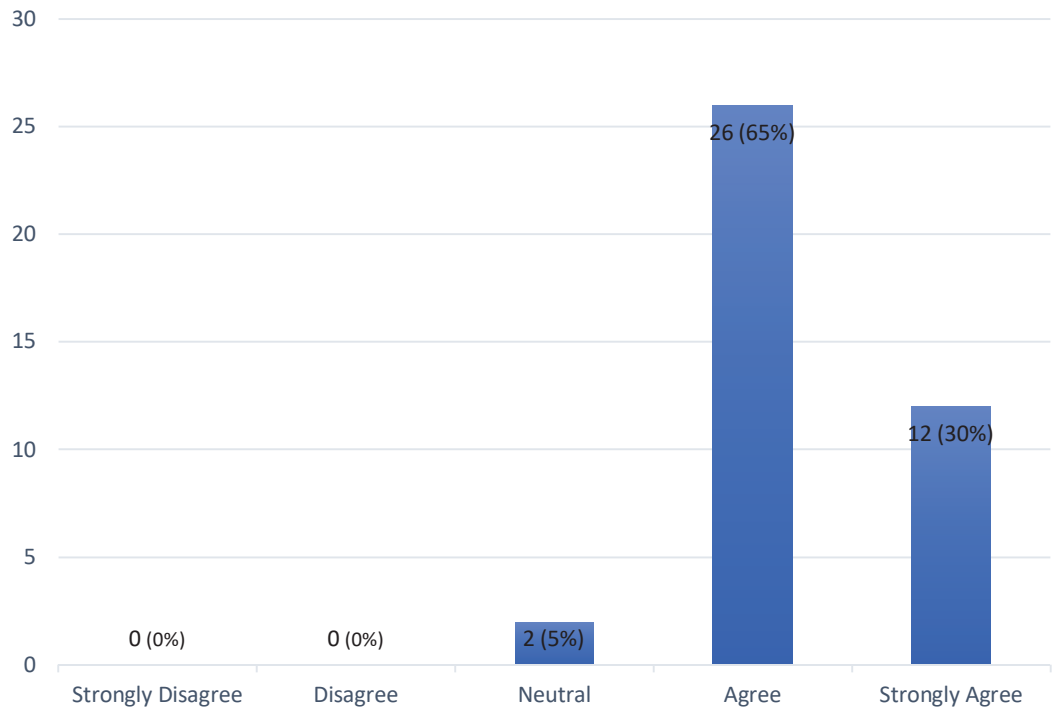

Figure 15: I am able to build professional relationship with members of my team.

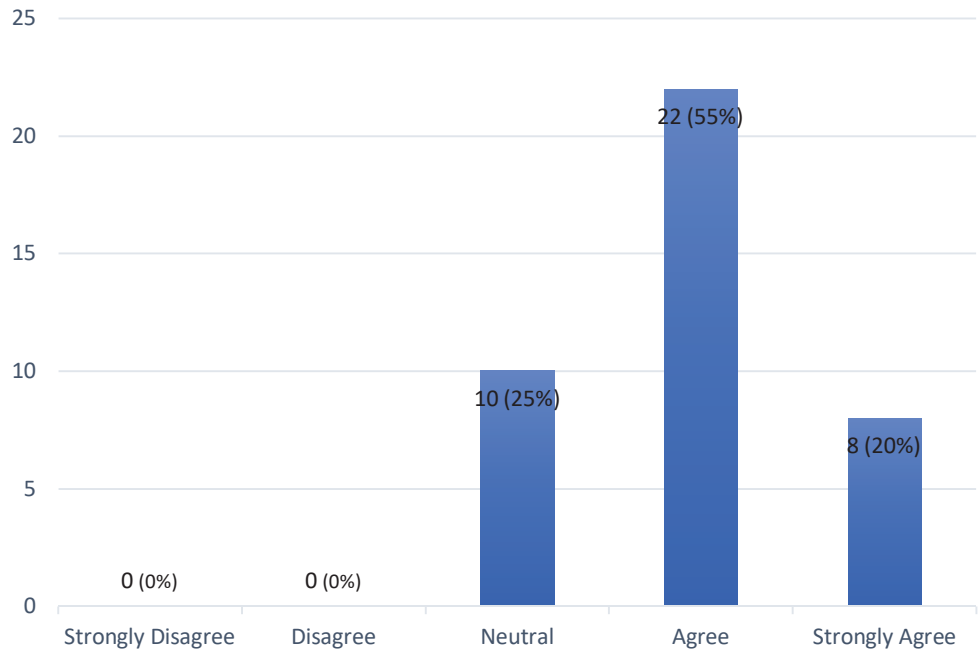

Figure 16: I am able to build professional relationship with other stakeholders.

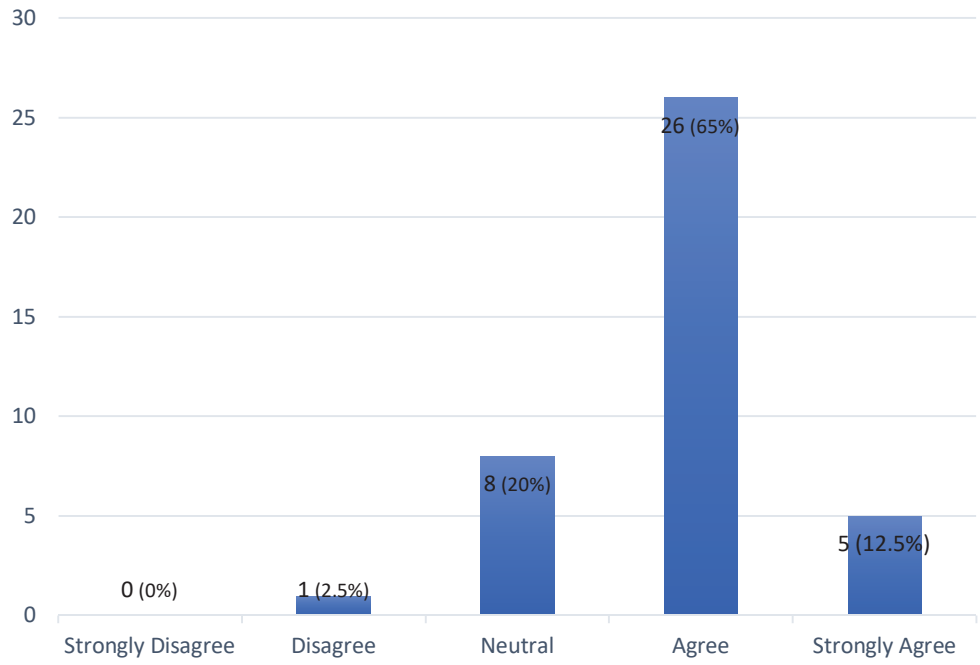

Figure 17: I influence my team in a strategic way.

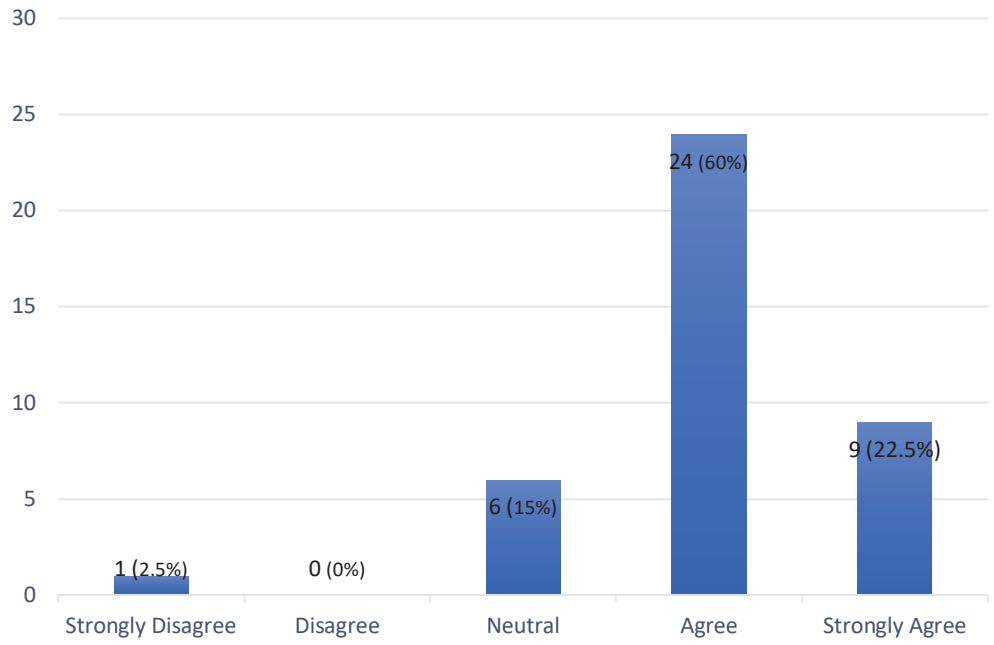

Figure 18: I am able to analyze and solve problems effectively.

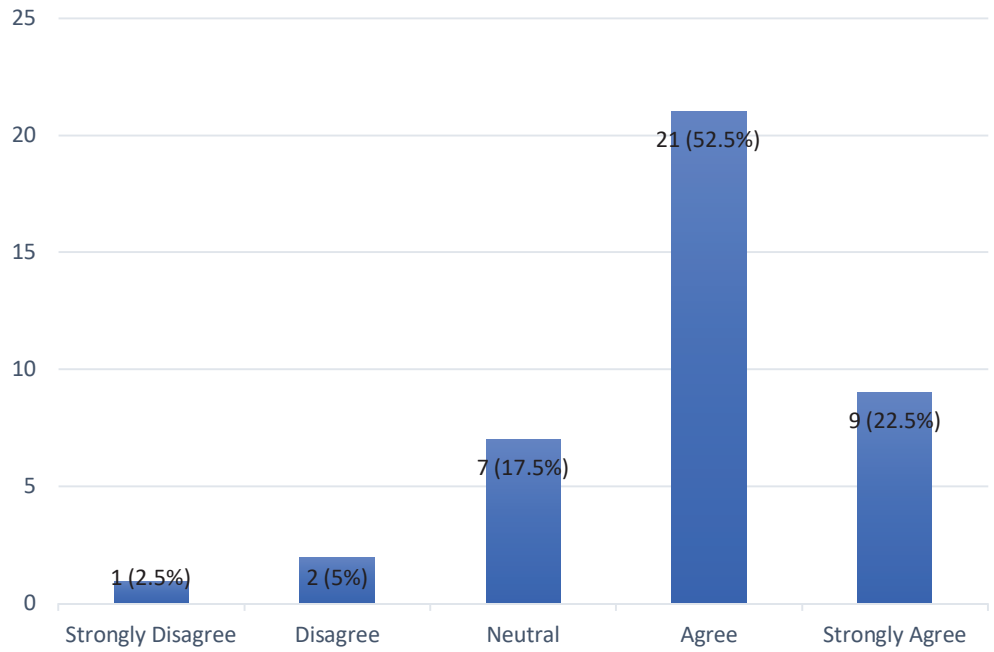

Figure 19: I have implemented product or service improvement within the department that I manage and in the workplace in general.

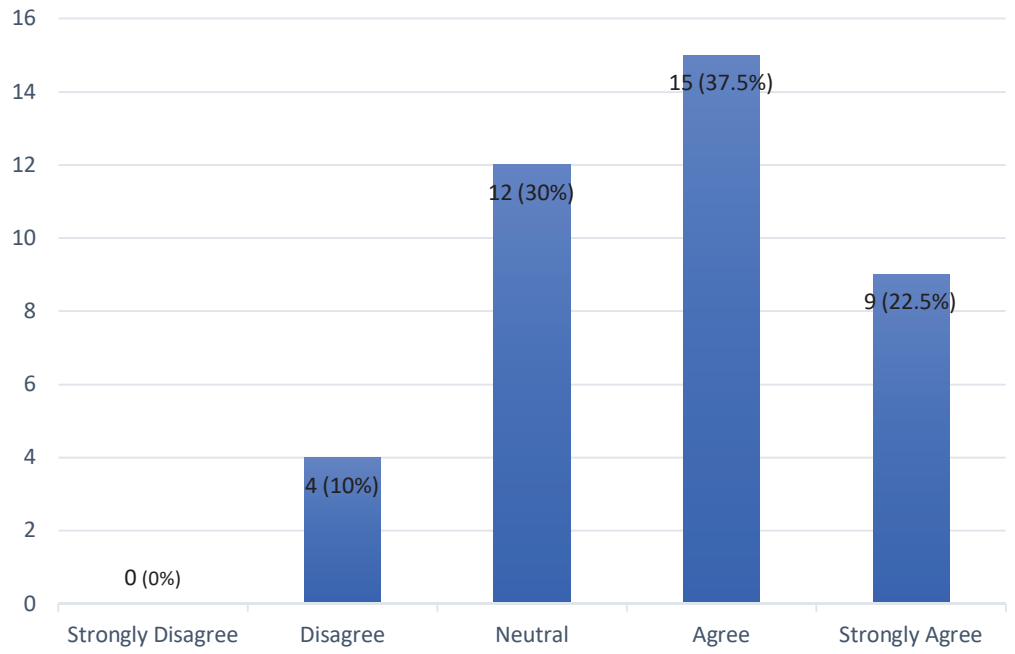

Figure 20: I have initiated product or service improvement within the department that I manage and in the workplace in general.

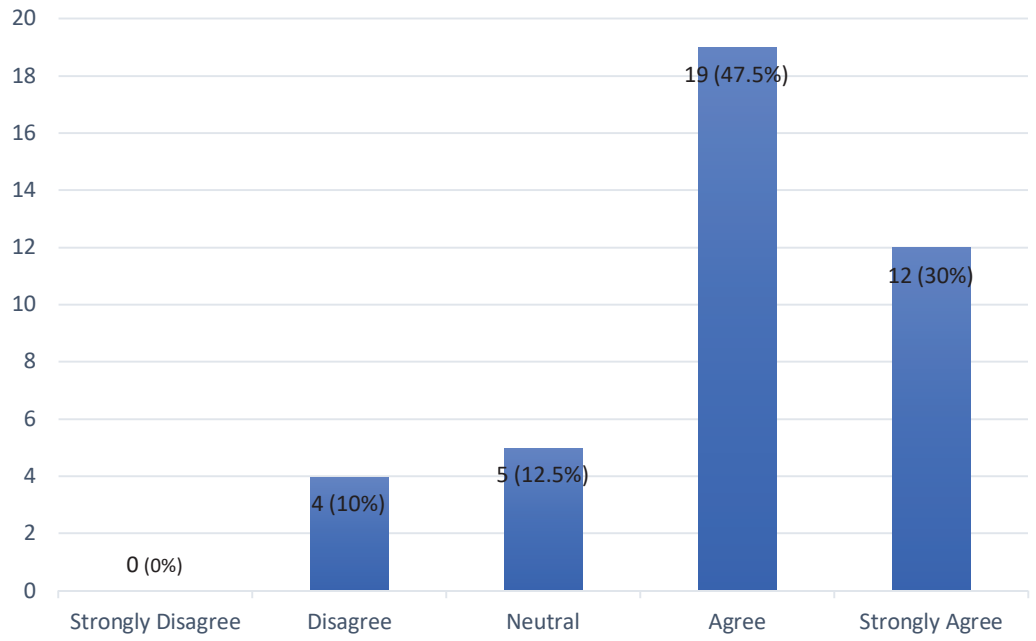

Figure 21: I have implemented product or service development within the department that I manage and in the workplace in general.

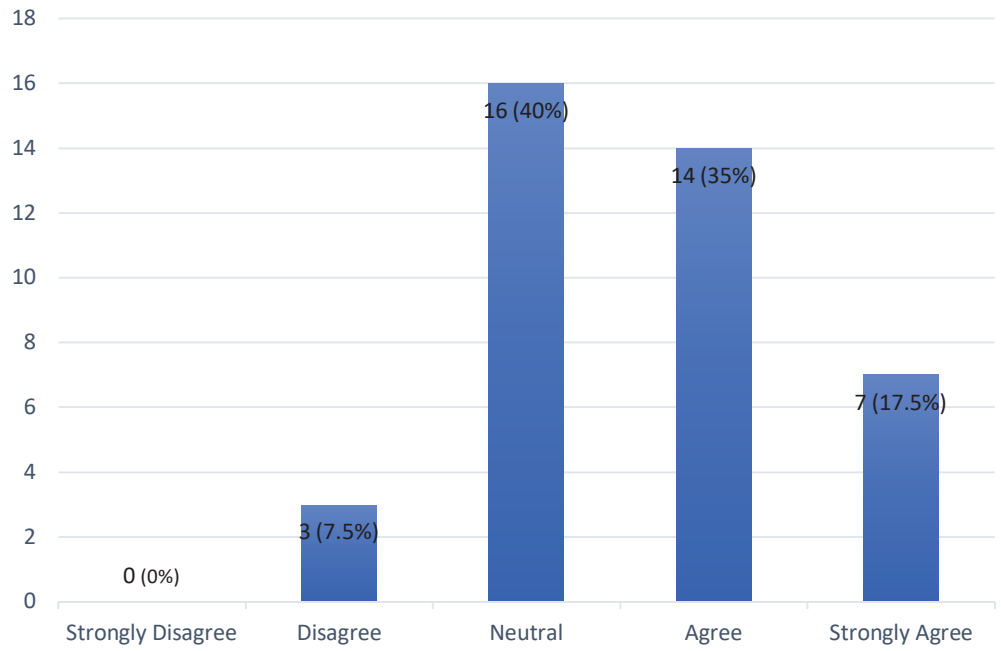

Figure 22: I have initiated product or service development within the department that I manage and in the workplace in general.

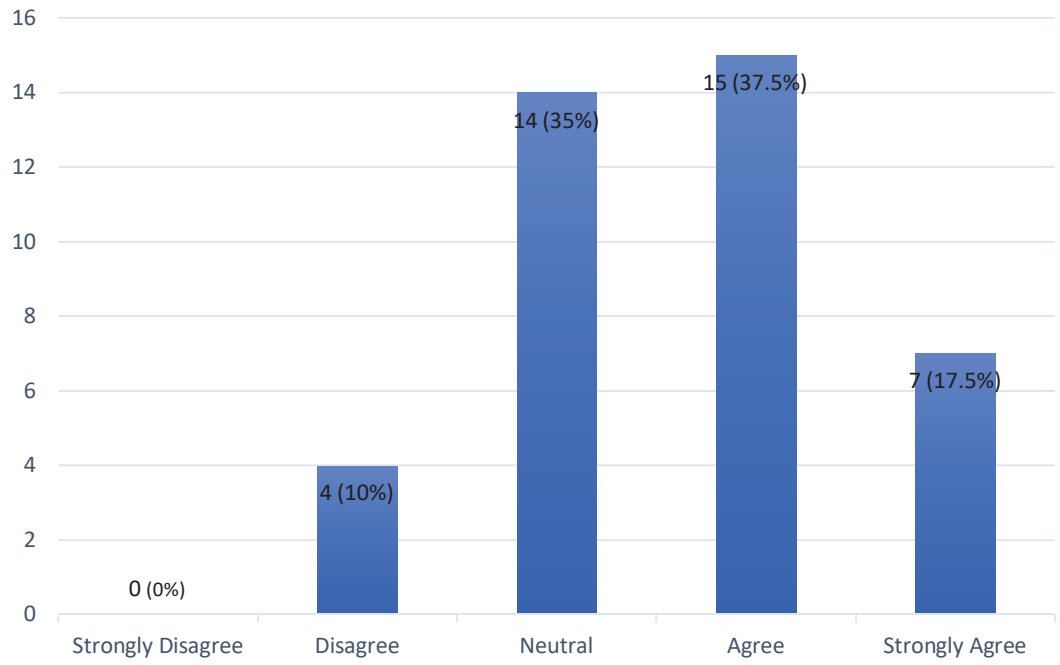

Figure 23: I have implemented organizational improvements within the department that I manage and in the workplace in general.

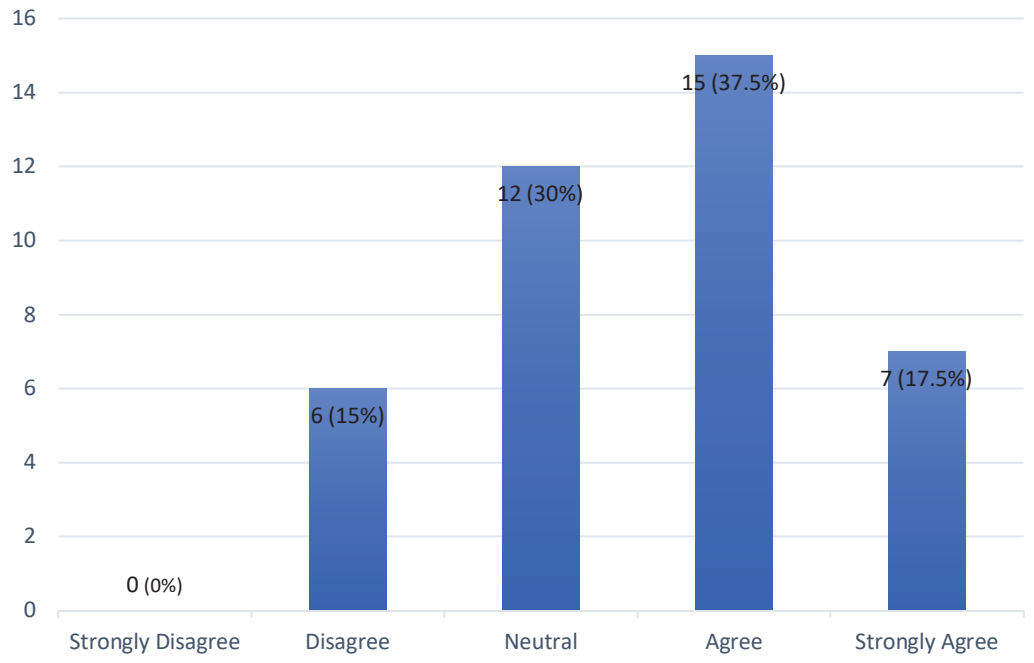

Figure 24: I have initiated organizational improvements within the department that I manage and in the workplace in general.

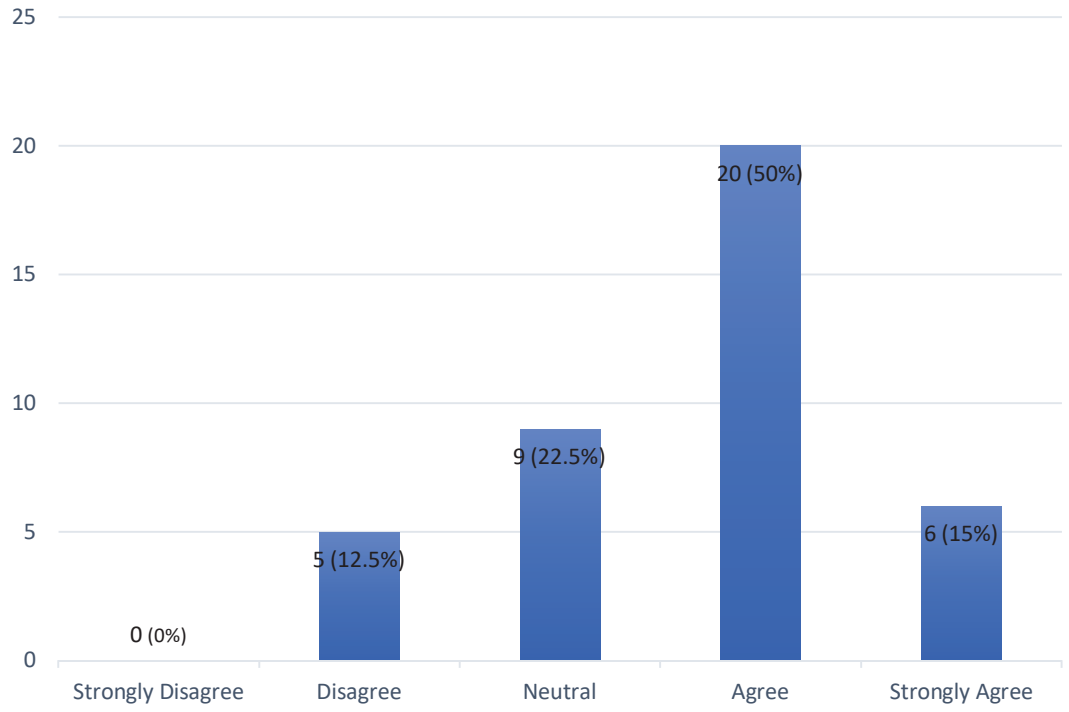

Figure 25: I have implemented innovative strategies within the department that I manage and in the workplace in general.

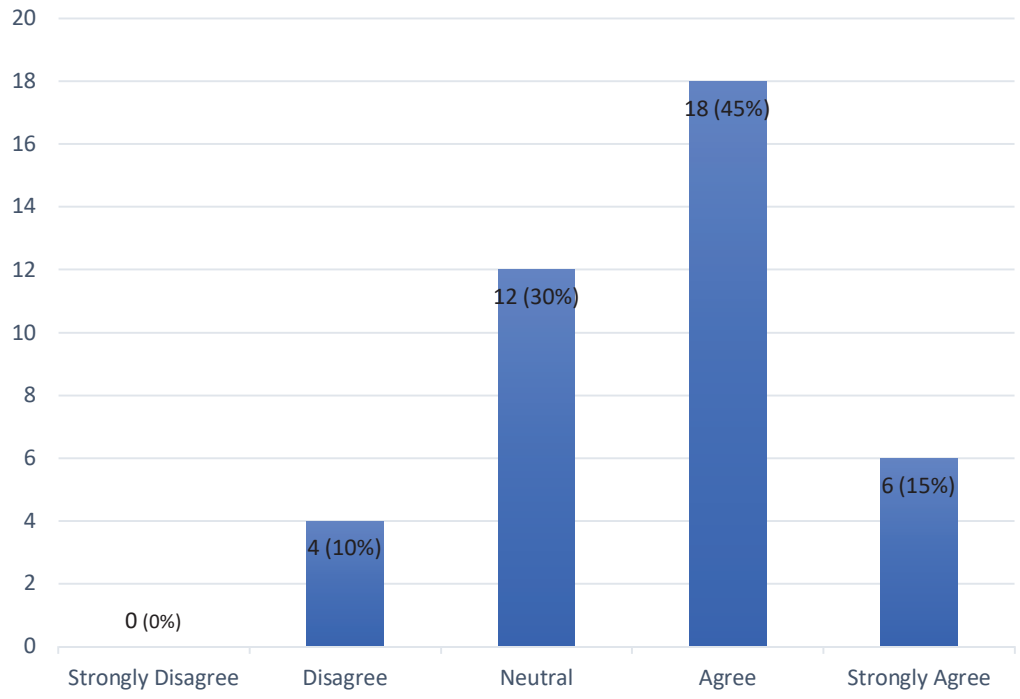

Figure 26: I have initiated innovative strategies within the department that I manage and in the workplace in general.

Table 12: Summary statistics

Variable	Observation	Mean	Std. deviation	Min	Max
MI	40	3.72	0.65	1	5
HS	40	4.04	0.84	1	5
SS	40	4.06	0.40	1	5
TI	40	3.80	0.77	1	5
nTI	40	3.63	0.72	1	5
A	40	2.58	0.78	1	5
G	40	1.2	0.405	1	2
E	40	2.98	0.48	1	4
MP	40	2.00	1.198	1	5
S	40	2.38	0.925	1	3

8.4. Scatter plots

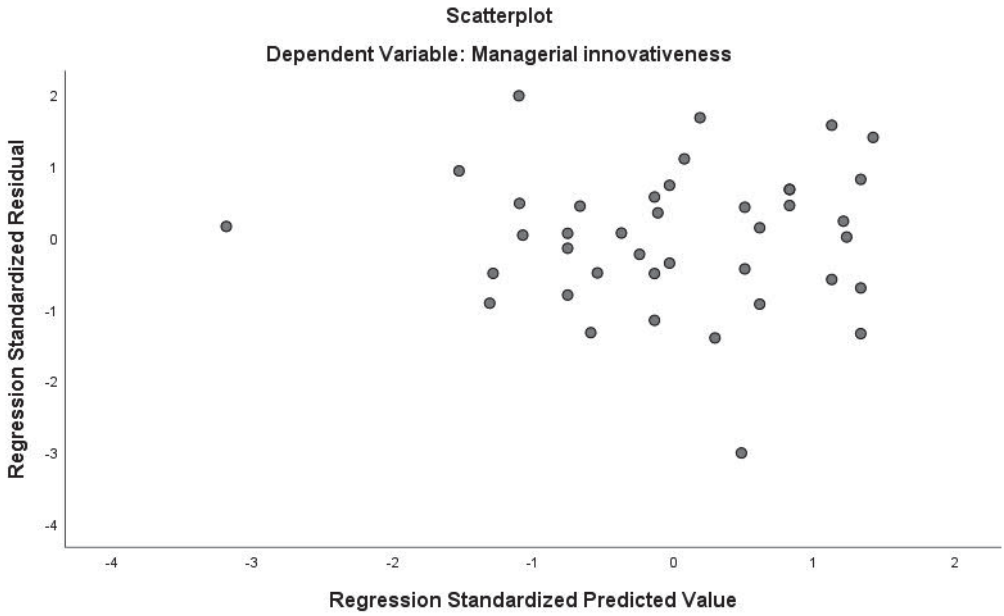

Figure 27: Scatterplot of Model 1.

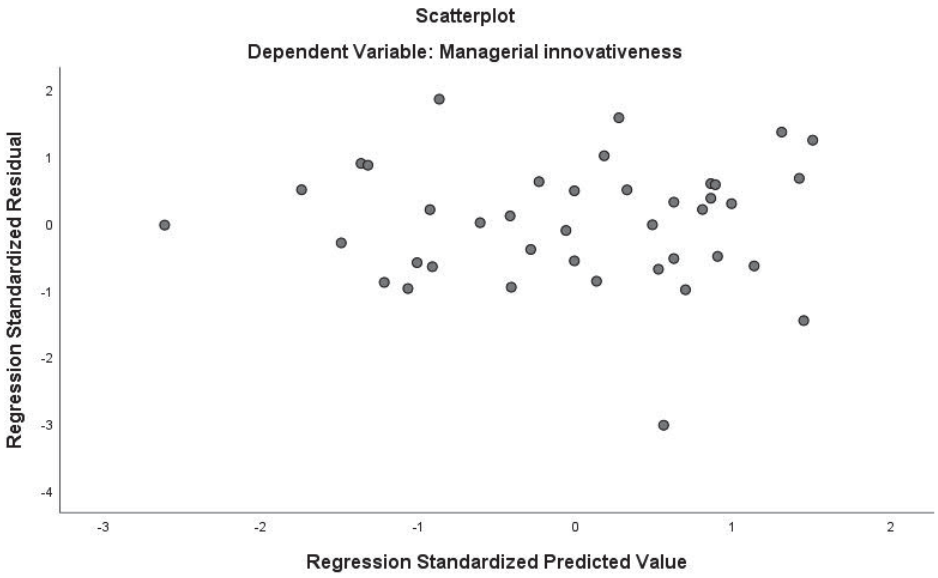

Figure 28: Scatterplot of Model 2.

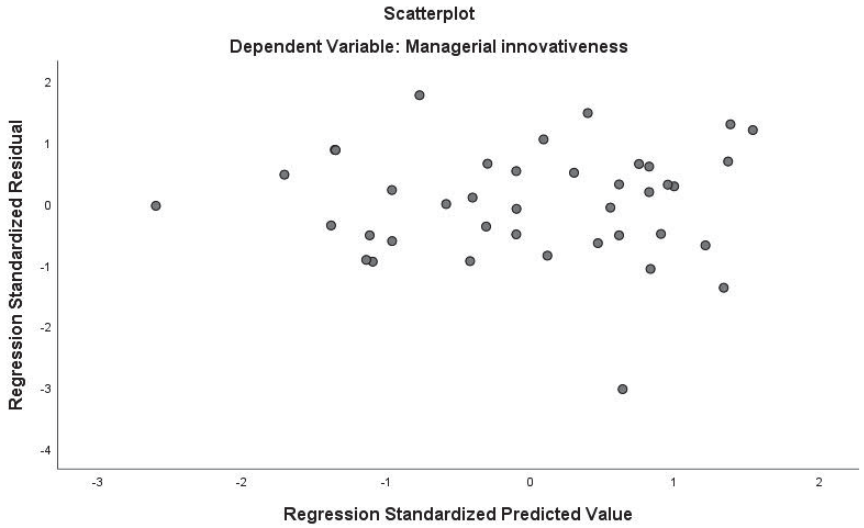

Figure 29: Scatterplot of Model 3.

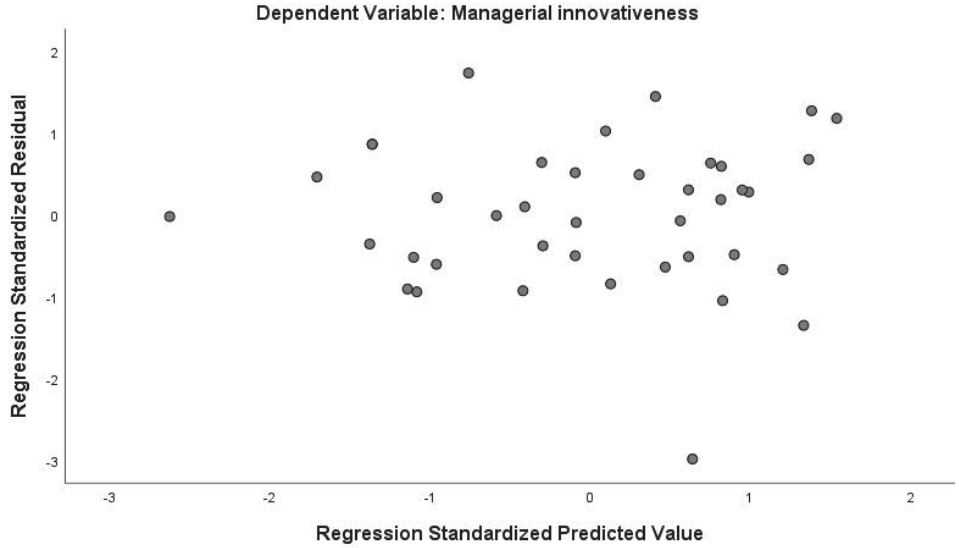

Figure 30: Scatterplot of Model 4.

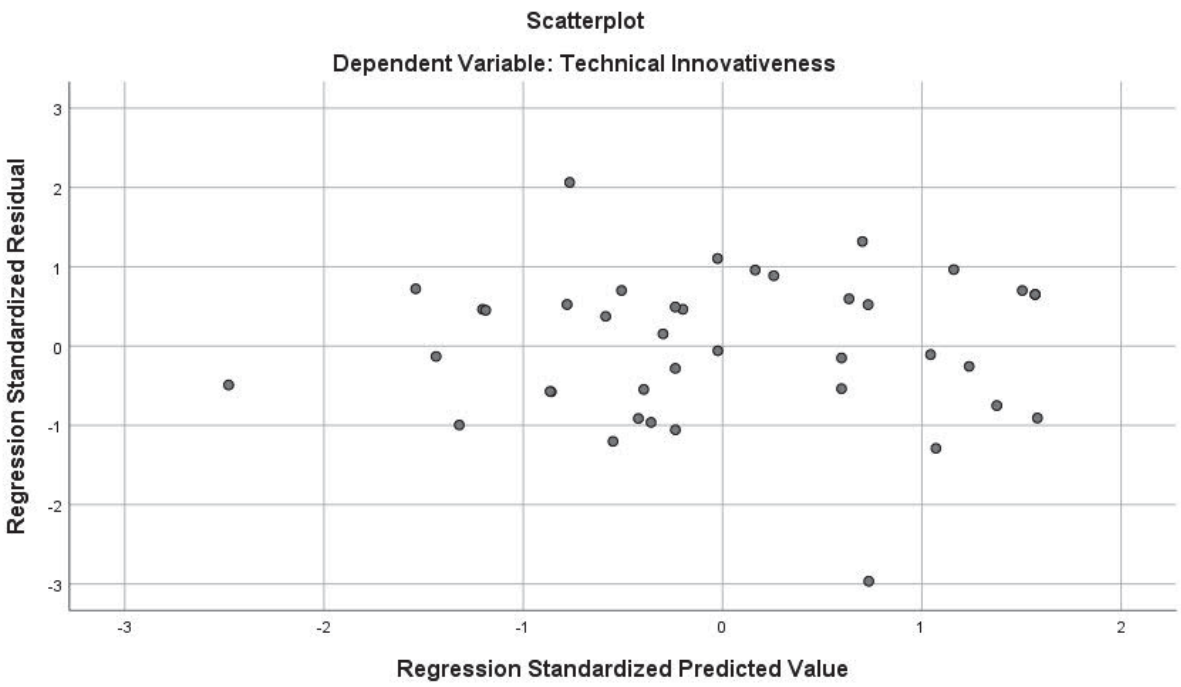

Figure 31: Scatterplot of Model 5.

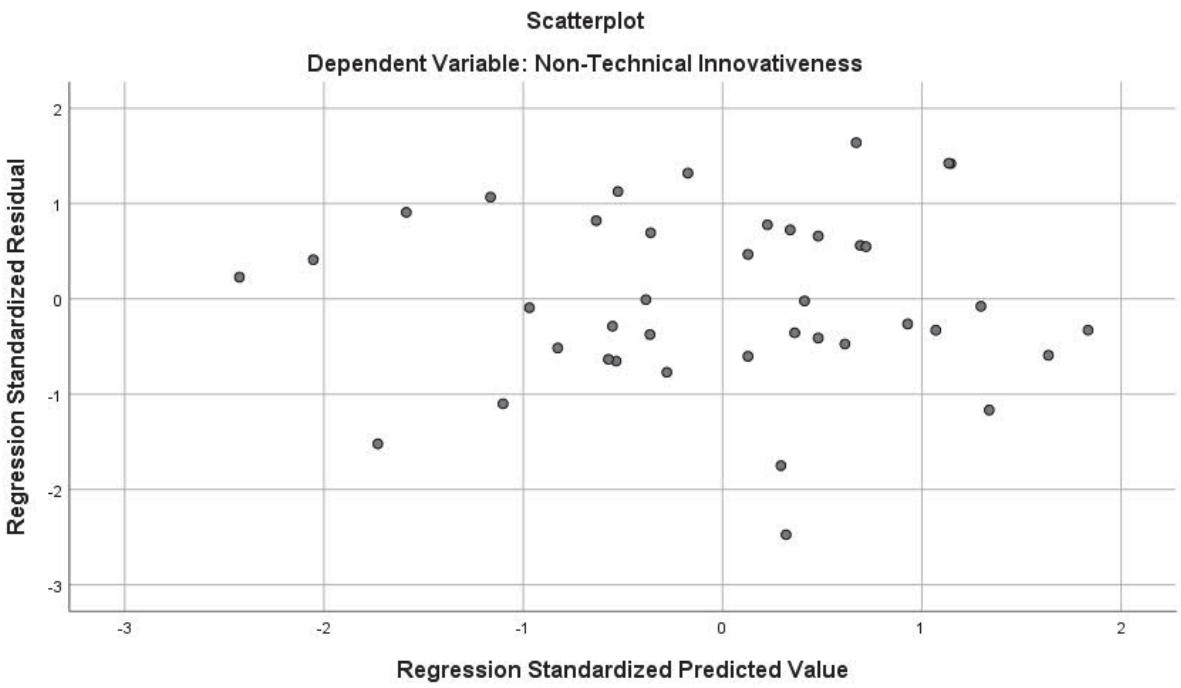

Figure 32: Scatterplot of Model 6.

8.5. Correlation matrix

Table 13: Correlation matrix of all variables.

Correlations											
			Managerial innovativeness	Hard skills	Soft skills	HS and SS interaction	Age	sex	Level of education	Years in management	Size of firm
Spearman's rho	Managerial innovativeness	Correlation Coefficient	1,000	,389*	,421**	,505**	,018	-,215	-,070	-,004	-,219
		Sig. (2-tailed)	.	,013	,007	,001	,912	,184	,669	,981	,175
		N	40	40	40	40	40	40	40	40	40
	Hard Skills	Correlation Coefficient	,389*	1,000	,153	,882**	-,007	-,132	,066	,003	-,152
		Sig. (2-tailed)	,013	.	,346	,000	,968	,417	,686	,983	,350
		N	40	40	40	40	40	40	40	40	40
	Soft skills	Correlation Coefficient	,421**	,153	1,000	,557**	-,119	-,030	,059	,007	-,454**
		Sig. (2-tailed)	,007	,346	.	,000	,465	,854	,719	,968	,003
		N	40	40	40	40	40	40	40	40	40
	HS and SS interaction	Correlation Coefficient	,505**	,882**	,557**	1,000	-,088	-,144	,129	-,027	-,309
		Sig. (2-tailed)	,001	,000	,000	.	,588	,377	,429	,870	,052
		N	40	40	40	40	40	40	40	40	40
	Age	Correlation Coefficient	,018	-,007	-,119	-,088	1,000	,062	-,299	,716**	,457**
		Sig. (2-tailed)	,912	,968	,465	,588	.	,705	,061	,000	,003
		N	40	40	40	40	40	40	40	40	40
	sex	Correlation Coefficient	-,215	-,132	-,030	-,144	,062	1,000	-,104	,133	,209
		Sig. (2-tailed)	,184	,417	,854	,377	,705	.	,523	,415	,196
		N	40	40	40	40	40	40	40	40	40
	Level of education	Correlation Coefficient	-,070	,066	,059	,129	-,299	-,104	1,000	-,344*	-,380*
		Sig. (2-tailed)	,669	,686	,719	,429	,061	,523	.	,030	,015
		N	40	40	40	40	40	40	40	40	40
	Years in management	Correlation Coefficient	-,004	,003	,007	-,027	,716**	,133	-,344*	1,000	,314*
		Sig. (2-tailed)	,981	,983	,968	,870	,000	,415	,030	.	,048
		N	40	40	40	40	40	40	40	40	40
	Size of firm	Correlation Coefficient	-,219	-,152	-,454**	-,309	,457**	,209	-,380*	,314*	1,000
		Sig. (2-tailed)	,175	,350	,003	,052	,003	,196	,015	,048	.
		N	40	40	40	40	40	40	40	40	40

*. Correlation is significant at the 0.05 level (2-tailed).

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