



THE ROLE OF PERSONALITY COMPOSITION ON TEAM CREATIVITY AND INNOVATION

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Dedicated to Refik and Şefik, my grandparents and role models

ABSTRACT

There is a growing interest in the literature on personality composition at work and its role in teamwork. The investigations undertaken, mainly focus on combinations of personality traits and their impact on general team performance. However, the influence of personality composition on creative and innovative performance of teams is not well covered within the literature. Thus, this research aims to investigate the role of personality composition on team creativity and innovation.

This thesis consists of two separate studies, both of which mainly examine the influence of personality composition – average levels and variability within teams – on team creativity and innovation. The first study focuses on the direct relationship between “big five” personality traits (openness to experience, conscientiousness, extraversion, agreeableness and neuroticism) and the creative performance of student teams, addressing the research question, *how does student team personality composition relate to the creative performance of a student team?*

The second study builds on the first study and addresses some of its limitations. In particular, the second study examines the interplay between personality traits (not only the big five, but also the dark triad that includes Machiavellianism, narcissism and psychopathy), team processes and team innovation in a knowledge intensive R&D context. Stated briefly, organizations operating in a knowledge intensive context are different in many ways from traditional firms and employ knowledge workers who are highly educated and well-qualified experts. These workers are responsible for innovative outcome through working in teams (Newell, Robertson, Scarbrough and Swan, 2009). The research questions of this study are, *how does knowledge worker team personality composition relate to the innovative performance of a knowledge worker team?* and *to what extent is the relationship between personality traits*

and innovative performance of a knowledge worker team explained (mediated) by innovation related group processes?

An Input-Process-Output (IPO) model of team innovation is the main theoretical framework that is used to conceptualize the relationship between inputs (big five personality traits) and outputs (student team creative performance) in study 1. Additively, the same framework used to conceptualize inputs (big five and dark triad personality traits), processes (innovation related team processes) and output (knowledge worker team innovative performance) in the second study (Hulsheger, Anderson and Salgado, 2009). For instance, within the second study, if mean level conscientiousness is high in a particular knowledge worker team it can be expected that the team is task oriented and therefore innovative.

Data for the Study 1 was gathered from undergraduate students operating in teams while Study 2 was conducted with knowledge workers working in teams; both studies used quantitative methods, specifically questionnaires. Creative and innovative team performance were assessed by external judges (the module leader in study 1, and managers in study 2). The results do not indicate any significant relationship between team creativity and innovation in either study. However, there are considerable associations particularly between personality traits and innovation related team processes in the latter study, and the findings are discussed within the thesis.

It is believed that the theoretical findings of this study will help researchers to build further on understanding the relationship between team personality composition, creativity and innovation. In addition, the practical implications will help decision makers to select appropriate group members to foster creativity and innovation within teams.

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ACRONYMS

KWT	Knowledge Worker Teams
TWT	Traditional Work Teams
IPO	Input-Process-Output Framework
KIF	Knowledge Intensive Firms
EFA	Exploratory Factor Analysis

CHAPTER.1: INTRODUCTION

In today`s new era, creativity and innovation are seen as particularly salient to society and its development. Globalisation brings its own opportunities and challenges together, and the environment in which the organisations operate, interact and compete is becoming more dynamic and fast moving. Therefore, governments, profit and non-profit organisations are searching for new ways in which to be adaptive and agile in such a changeable and highly competitive environments.

Within the conditions of increasing complexity and transformation, effective teamwork is seen as one of the most crucial response and success factors for organisations. Agencies are also well aware of the benefits of collaborating with individuals in order to flourish through novel ideas, and to create value from those ideas. Therefore, organisations are increasingly designing team-based structures in order to be able to increase collaboration within, and even outside the organisation, and to respond to changes within the competing environment. Scholars estimate that four out five organisations that have more than 100 employees utilise teamwork in their everyday operations (Osterman, 1994; Cohen and Bailey, 1997). For instance, studies within the UK have found that around 70% percent of organisations use teams (Waterson et al, 1997; Cully et al, 1998). Another key finding is revealed by Offerman and Spiros (2001) who found that managers spent 40% of their time on dealing with teams they are responsible for.

Indeed, organisations use teams to achieve different targets, such as for productivity, completion of market research, product sales or innovation. In particular, in response to the increasing competition and complexity fostered by globalisation and technological

developments, organisations need to introduce new means of operation to be able to survive and compete (Bessant and Tidd, 2011). In other words, innovation is increasingly becoming one of the top priorities of organizations competing in today's dynamic and fast-moving business environment. In this sense, teams are seen as a crucial structural and strategic solutions required in order to be innovative. In fact, within teams, groups of individuals come together and combine their efforts in order to deal with complex problems and devise creative ideas and innovative solutions. As a result, creativity and innovation within organisations is tackled by teams, instead of individuals who are responsible for separate tasks (Henry, 2001; Caldwell and O'reilly, 2003, Nijstad and Levine, 2007; West, 2012).

As can be understood from the above, innovation is one of the most important effectiveness criteria for organisational teams operating in a challenging and innovation-oriented context. In this regard, one effective way to innovative, team-based effectiveness is to adopt an input-process-output (IPO) framework. This framework was developed by McGrath in 1964, and then refined by Hackman and Morris in 1975; it was actually applied to team creativity and innovation field by West and Anderson in 1996. In fact, this theoretical framework has been used for conceptualising the relationship between input and process factors which are related through innovation.

Researchers, managers and employees determine various input factors (job design, context, team size, etc.) which can assist teams in being innovative within organisations. Team composition is one such input factor, and is seen as vital for teams to reach their goals. In fact, recent research that combines psychology and organisational studies stresses the importance of the personality composition of teams and its effects on team outcomes. What is more, there

has not been sufficient focus on the relationship between team personality composition and innovative performance. However, it is crucial to understand the effect of psychological factors such as personality composition on complex tasks such as creativity and innovation (Bechtold, De Dreu and Nijstad, 2007). This thesis specifically focuses on the creative and innovative outcomes of teams, and will investigate the influence of personality composition on such outcomes. In other words, the main question for this research is “*how personality composition relates to team creativity and innovation*”.

In this research project, the relationship between personality and team creativity, as well as innovation, is analysed through two distinct studies conducted in different contexts. The initial study simply probes the association between inputs (big five personality traits) and outputs (creative performance of student teams). The latter, and the more extended study, will investigate the “big five” and “dark triad” personality traits (inputs) and their effects on team innovative performance (output) through innovation-related group processes. Table 1.1 below presents the research questions based on the study and relationship types amongst variables.

Table 1.1: Summary of Relationships and Research Questions Addressed in This Research

<u>STUDIES</u>	<u>RELATIONSHIP TYPE</u>	<u>RESEARCH QUESTIONS</u>
STUDY 1	Direct Relationship	<i>Is there any relationship between the mean level of personality traits and creative performance of a student team?</i>
	Moderating Relationship	<i>How does variability in personality traits affect the relationship between mean level personality traits and creativity of student teams?</i>

	Mediating Relationship	None
STUDY 2	Direct Relationship	<i>Is there any relationship between the mean level of personality traits and innovative performance of a knowledge worker team?</i>
	Moderating Relationship	<i>How deso variability in personality traits affect in the relationship between mean level personality traits and creativity of student teams?</i>
	Mediating Relationship	<i>How is the relationship between personality traits and innovative performance of a knowledge worker team explained by innovation-related group processes?</i>

Based on the research questions above, this research has four subsidiary objectives:

- 1) *This thesis includese two studies undertaken in different contexts. The first study is conducted in a module that is artificially designed by the module leader whereas the latter study is conducted in real knowledge intensive R&D organisations. To this end, this research will investigate the extent to which this context has an influence on team creativity and innovation.*
- 2) *As stated in the title, this thesis will aim to determine whether personality has an influence on team creativity and innovation. On this basis, the first study focuses on the direct relationship between the big five personality traits (input) and creative performance of student teams (output). For the second study, the main objective is to examine the impact of the big five and dark triad personality traits on innovative performance of knowledge worker teams. Additionally,*

the latter study will also assess the mediating role of innovation related team processes on that relationship.

- 3) To tackle not only the impact of mean level personality on team creativity and innovation but also to investigate the moderating influence of variability in personality on the association between mean level personality and team creativity and innovation.*
- 4) To understand whether the existing findings in the literature on the relationship between personality composition and general performance informs as to the influence of personality on team creativity (study 1) and innovation (study 2).*

1.1 TEAMS

In today's world, with the effect of globalisation and technological developments, the borders between countries (particularly in terms of business) are disappearing, the markets are expanding and they cover not only the local country but also other countries and even continents. Thus, markets are becoming worldwide (Mead and Andrews, 2009). As a result of these changes, organisations are expected to adapt the new rules of the dynamic and global environments. Competition is fierce and innovation is one of the core strength factors for many organisations operating in complex environments (James, 1997). Hence, in many situations, organisations are encouraged to benefit from teams rather than individuals (Curral, Forrester, Dawson and West, 2001). It is also believed that in some situations teams as a group of people can accomplish better results than one individual can when working alone, and team-based working can meet the workers' needs while increasing productivity (George and Jones 2005; Doorewaard, Hootegem, Huys, 2002; Richter, Dawson and West, 2011). As a result, there has been a considerable increase in teamwork usage throughout the recent decades (Richter et al, 2011)

1.1.1 What is a team?

There is no universally agreed definition of a “team”; instead, there are many different definitions in the literature. However, these definitions have some consistent characteristics of teams. These characteristics can be listed as shared common goals, shared responsibility and identity, working closely together in small numbers, mutual influence and interdependence (as shown in Table 1-1) (Proehl, 1997; Johnson and Johnson, 2000). On the other hand, there may also be inconsistencies in the literature according to the skills, authority and temporal stability of the members within teams (Hollenback, Beersma and Schouten, 2012). For instance, in their recent paper, Hollenback et al. (2012) determined 42 different team types, which have different definitions and characteristics.

Table 1.2: Team Definitions that Have Certain Characteristics

Author(s)	Definition	Common Characteristics
Salas et al. (1992)	A team is “a distinguishable set of two or more people who interact, dynamically, interdependently, and adaptively toward a common and valued goal/objective/ mission, who have each been assigned specific roles or functions to perform, and who have a limited life-span of membership” (p. 4).	1) Membership was stable over time 2) Mutual responsibility and interdependence
	A team is “a group of people working together in an organisation...who are committed to	3) Membership was assigned only or primarily to that team

Richardson (2010)	achieving team-level objectives upon which they agree; who have to work closely and interdependently”	
Kozlowski and Bell (2003)	Teams as collectives “who exist to perform organisationally relevant tasks, share one or more common goals, interact socially, exhibit task interdependencies, maintain and manage boundaries, and are embedded in an organisational context that sets boundaries, constrains the team, and influences exchanges with other units in the broader entity” (p. 334).	4) Shared common goals and responsibilities 5) Defined roles and tasks

People in organisations, particularly managers, usually use the term “team” just for the sake of it and then it becomes more difficult to understand what the team really is. Groups or other collectives or the entire organisations can practice teamwork yet they are not equal to teams (Lyubovnikova, West, Dawson and Carter, 2015; Allen and Hecht, 2004). In their famous book *The wisdom of teams* Katzenbach and Smith (1993a, p.21) define “teamwork” as a “*Set of values that encourages behaviours such as listening and constructively responding to points of view expressed by others, giving others the benefit of the doubt, providing support to those who need it, and recognizing the interests and achievements of others.*” If organisations practise such attitudes, both individuals and organisation as a whole can operate more effectively. Teamwork values do not just cover teams, they can work for any groups, department and whole organisation. However, these values are not enough to become a team and perform as a team

(Katzenbach and Smith,1993a). Teams need to have several common characteristics (as aligned above) to become a team.

To have shared common goals is one of these crucial characteristics (Lyubovnikova et al, 2015). In teams, members often have difficulties in reaching to a consensus on the team`s targets and purposes; therefore, someone (e.g. team leader, outside manager etc.) needs to set the direction for the teams. This direction should be clear enough for team to determine its goal and flexible enough to be adjustable by the team members (Hackman,1990). Teams often spend more time in determining their main objective and this will give energy and meaning to the job that the team members deal with. For effective teams the main purpose of the team is really important. They don't just determine it they also discuss it as the process continues and, if necessary, revise and change it. To reach that main purpose, teams need to set related specific performance targets that assist teams to focus on results and help team members to be aware of the team`s position during the process. (Katzenbach and Smith, 1993a).

Team members also need to develop a common approach and a mutual responsibility. Common approach indicates the ways in which team members act towards the main purpose of the team. Each member brings his/her own strengths and weaknesses to the team and through mutual understanding and adjustment a team can develop a common approach and distribute tasks effectively (Katzenbach and Smith,1993a). Mutual responsibility arises through commitment and trust among members. It can be thought of as the result of proper team purpose and joint approach that are determined by members themselves. In other words, it can be said that if mutual responsibility, trust and commitment are high in groups, this means that

they have an adequate common purpose and approach that make them a real team (Kozlowski and Bell, 2003; Katzenbach and Smith, 1993a).

Teams also need to consist of people whose skills are complementary to work effectively. For instance, technical, communication and problem-solving skills are the prominent skills that teams generally need for effectivity (Larson and Lafasto, 1989). It is of note here, however the skills needed may change depending on the task type and the context in which teams are operating (Curral et al, 2001) To accomplish targets, teams need to have or develop necessary skills. Initially many teams do not have the right skills but the level and quality of interaction and knowledge-sharing supports learning and the good teams are the ones that learn and develop the missing skills (Hackman, 2009).

Teams also have boundaries and work in a larger social system (e.g., in a department or organisation) and its main components technology, structure, culture, strategy, and leadership has an impact on teams' internal and external interactions. (Hackman, 1990, Kozlowski and Bell, 2003). However, their interactions with the environment may depend on the team's task and responsibilities. For instance, a team that operates in an assembly line may, at most, interact with the other people in the operations department in daily work time. However, a team that operates in a marketing department and deals with the marketing strategy of the organisation may need to communicate with various outsiders and shareholders (Ancona and Caldwell, 1992).

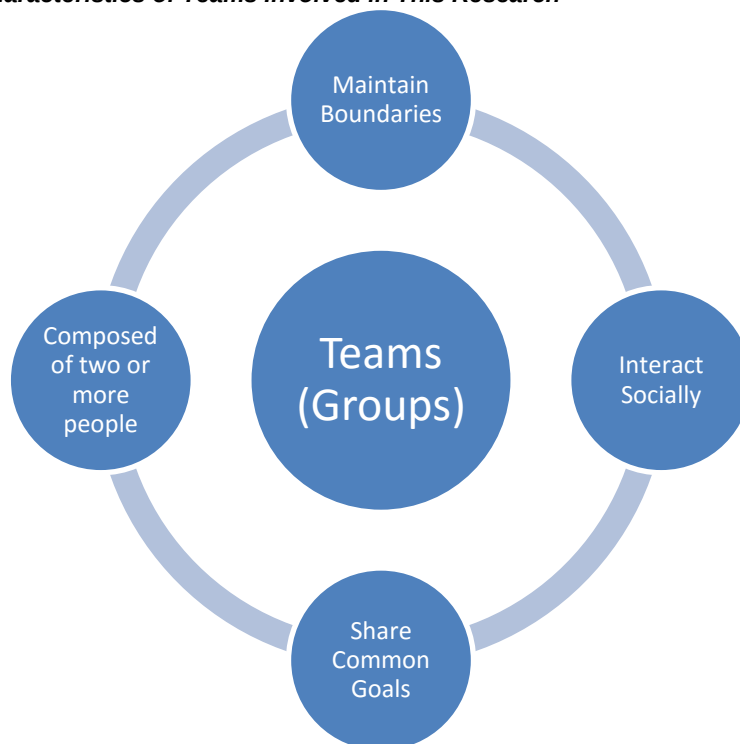
It is also crucial to add that, firms in Western countries tend to give more chance to individualistic structures rather than team-based ones because of the culture and its emphasis

on individualism. However organisations in some situations need to overcome these tendencies and use teams effectively to gain competitive advantage (Katzenbach and Smith, 1993a). In teams generally, the individuals' performance and tasks become a matter for the team rather than supervisors and managers since mutual responsibility of team members automatically generates a concertive control among team members (Barker, 1993). Management's approach to the team is really critical and teams need to be considered and assessed as a complete unit rather than individuals working together. In other words, as Hackman (2009) argues, the focus needs to be on teamwork processes rather than the individuals.

Some researchers started to argue that it is time to reconsider the definitions of teams and there is a need to update the definitions according to changes in the organisations and their approaches to teamwork (Murase et al, 2012). Particularly in the last two decades, competitive markets have become more innovation driven and organisations have redesigned their structures and strategies to become more creative and generate value from innovation (Tissen, Andriessen and Deprez; 1998). Innovation requires adaptability, knowledge-sharing and collaborative cognitive efforts. Therefore, shifting to team-based work and flourishing interaction among individuals has become a necessary movement. In fact it is argued and supported by research that having creative and focused teams is essential for organisations to innovate and become successful (Caldwell and O'reily, 2003; Drach Zahavy and Somech, 2001; Fay, Shipton, West and Patterson, 2014). Thus, in today's fast-moving sectors, owing to the competitive pressures and drive for creativity and innovation implementation, teams are used by many competitive companies to become more agile, responsive and leaner (Mathieu, Maynard, Rapp and Gilson, 2008; Somech and Drach, Zahavy, 2013). In some cases, teams are formed in a planned and systematic way, in other cases teams are composed in a more haphazard,

informal and quick way. Teams are formed, redesigned and disbanded quicker than ever (Tannenbaum et al, 2012; Edmondson, 2012). As this research aims to shed light on team creativity and innovation-related research it will be more useful to use definitions that are simple, flexible and easy to understand to present and embrace teams operating on complex tasks. Therefore, teams can be defined as “*groups of people who interact socially and perform tasks to achieve mutually shared goals*” (West, 2012). In addition, “group” and “team” terms will be used interchangeably. Having considered both studies conducted, the main characteristics of teams in this research context are shown in the Figure 1.1 below (Kozlowski and Bell, 2001).

Figure 1.1: Main Characteristics of Teams Involved in This Research



1.1.2 What are the benefits of teams?

According to the literature, there are many benefits of teams. The most important ones are flexibility and quick responses to changes in environment, helping organisational development processes, innovation and creative problem-solving, (Hackman 1987, Curral et al, 2001, Clegg, Pitsis and Cornberger, 2009). The team ideology receives enormous support from many researchers all around the world. Teams are represented as multiple satisfying tools of everything from individual needs to organisational needs (Sinclair, 1992).

What is more, teams can be a crucial weapon for organisations to gain competitive advantage, particularly for the ones that operate in really challenging sectors, because of their agility and speed. Additionally, they rapidly get together, work together and disband (Kozlowski and Bell, 2003; Katzenbach and Smith, 1993a). They can give quick responses to customers' reactions, industry moves and new trends. More to the point, teams assist behavioural change and give way to individual learning as well as have a significant impact on organisational effectiveness and development (Hackman, 2009).

Effective management and composition of teams is also crucial for innovation and creative problem-solving (Larson and Frank, 1989). Teams increase interaction and knowledge-sharing and therefore give way to new knowledge creation (Newell et al, 2009). In this regard, heterogeneous groups that consist of members who have complementary skills and knowledge, can be particularly helpful units for creative problem-solving, and innovation. As a result, it seems that organisations competing in innovation and new knowledge-creation oriented sectors need to consider using teams in an effective way (West, 2012). Additively, considering the personality composition during the team formation process is argued and found to be important

for the team performance (Mohammed and Angel, 2003; Bechtold et al, 2007). Accordingly, in this research the influence of personality on team creativity and innovation is in question.

There are also positive psychological effects of teams on team members. Becoming a member of a team can sometimes be fun and therefore help to decrease the level of stress and work pressure (Katzenbach and Smith, 1993). Besides, being a part of a social group can help individual members to socialise and increase their self-esteem, which may cause members to derive satisfaction from teamwork and adapt quickly (Allen and Hecht, 2004, Blair, 1991).

1.1.3 The Dark Side of Teams

On the other hand, some studies carried out to assess effectiveness of teams in organisations do not seem to support teamwork and its wide range of benefits (Locke, Tirnauer, Roberson, Goldman, Latham, Weldon, 2001; Glassop, 2002). As a result, teams can also be counterproductive. Teamwork can create challenges for organisations; interpersonal psychological issues among team members can take significant time and resources of management (Clegg et al, 2009). Hence, organisations need to be managed carefully and effectively so that team-based structures can push organisations to productive and innovative ends (West, Brodback and Ritcher, 2004).

There is a tendency to disguise the dark side of teams within the literature and this has been criticised by a number of scholars (Sinclair, 1992; Allen and Hatch, 2004; Naquin and Tynan, 2003). For instance, the critical review about organisational teamwork within the literature, scholars posited that, teams could also be counterproductive however both scholars and practioners seems to perceive teams as a lot more effective (Allen and Hatch, 2004). As a

result, teams are presented as vital tools for organisations. Moreover, in many situations organising around teams or using teams to solve particular problems are seen as indispensable receipts for both individuals and organisations. On this matter, I agree with the argument that teams can indeed be beneficial but not all the time or in every situation (Hackman, 2009). Nevertheless, team framework has dominating effects on both scholars and practitioners (managers, decision-makers etc.) (Allen and Hecht, 2004). Thus, there is a significant focus on the benefits of teamwork. However, managers or strategic decision-makers in organisations have to consider the other concealed sides of teams. According to Sinclair (1992), using teams in an organisation helps to hide coercion, conflicts, conformity, delayed actions, expedient arguments etc., and teams are also used due to lack of leadership. What is more, although many management and organisation scholars claimed that teams help to increase their members' motivation, the research showed the opposite (Nadler, Hackman and Lawler, 1979). In fact, it is argued that teams can increase the tension and stress between insiders of the group (Sinclair, 1992). Therefore, it is crucial for organisations to consider the negative sides of teams and think about the problems (discussed above) that can be created by team-based work types. Although, both in theory and practice teams are seen as indispensable tools for innovation, bringing various types of people together in teams may need conscientious consideration.

One thing to consider is the heterogeneity of teams - which means having diverse members in terms of various dimensions. There can be many dimensions of diversity such as demographic dimensions of age, gender, and nationality, and also other deep level dimensions'; personality, values, attributes, skills and functional backgrounds of members (Harrison, Price and Bell; 1998). Scholars divided these dimensions into two separate categories. Individual surface level attributes that are easily observable, such as age, gender and ethnicity, are

grouped under the social category diversity. On the other hand, deep level dimensions that are less visible, such as personality, skills, backgrounds and values are added into the informational and functional diversity. One mainstream argument regarding creative performance is related to informational and functional diversity. The idea is that having diverse skills, backgrounds and values elicits different perspectives and alternative skills, various networks and resources to solve the problems or accomplish the task in hand (Ancona & Caldwell, 1992). However, it is argued that these dimensions and categories should not be assumed as having separate and private relationships with creativity (Knippenberg, De Dreu and Homan, 2004). In other words, teams that are rich in terms of informational and functional diversity may still operate with poor creative performance because of the problematic subgroup relations caused by the social category diversity within the team. For instance, a research and development project team that consists of both Chinese and German members may informally divide into two subgroups with problematic relations in terms of communication and trust. Therefore, scholars claim that the researchers who investigate the effects of diversity need to approach the field with a comprehensive view. Additionally, they need to consider both categories of diversity within the teams and use mediating and moderating processes to explain the relationship between diversity and performance. This thesis also investigates the diversity in teams in terms of personality, and aim to investigate the impacts of these factors on the creative performance of student teams. Additionally, the input-process-output model is a basis model for this study, which is in line with the arguments above.

1.2 PERSONALITY AND BIG FIVE FRAMEWORK

Pervin (1980) defines personality as *"individuals' unique and stable pattern of thinking, feeling, acting and reacting to his or her social environment"* (cited in Bechtoldt, Dreu and Nijstad; 2007). In addition, trait theories take these individual differences in behaviour, thought and emotions all of which can be explained and described by personality traits (Woods and West, 2010). For instance, some individuals' value building trustable relationships with others in their social environment, while others prioritise self-enhancement and therefore seek for more status and power (Bechtoldt et al, 2007). As these traits have an impact on the individuals' interactions with others, trait approaches to understand and categorise individual characteristics have drawn the attention of many social scientists (Arnold and Silvester, 2004). Drawing from here, it is argued that the personality traits also have influence on the work related attitudes and relationships of the individuals (Barrick and Mount, 1991). Accordingly, personality has been considered as a potential predictor of job performance since the early stages of research and it has been used principally for personal selection to firms, departments or teams (Muchinsky, 2006; Robertson, 2002; Chmiel, 2008). In their study, Dunn and his associates (1995) also underlined the importance of personality traits in managerial issues (Dunn, Mount, Barrick and Ones, 1995).

Throughout the decades of academic efforts and debates, research has managed to generate a number of consistent frameworks that effectively conceptualise the dimensions of human personality (Arnold et al, 2010). The Big Five personality traits framework has become the most accepted and well-used approach that has its roots in personality traits theory (McCrae and Costa, 1992; Robertson, 2002). Therefore, this research uses this framework in order to conceptualise personality in two distinct teamwork contexts in Study 1 and Study 2.

The “Big Five” taxonomy is based on a comprehensive review and arises through a compilation of a large number of personality traits revealed in previous research (Woods and Hampson, 2005). This approach involves five distinct personality factors namely; openness to experience, conscientiousness, extraversion, agreeableness and neuroticism, which can be representative in a research project (Costa, McCrae, 1988). Every individual’s personality can be described with one of the big five personality factors and each dimension is a continuum in itself such that there is an opposite end for each Big Five construct (Peeters, Van Tuijl, Rutte and Reymen; 2006).

- 1.** Openness to experience, as a first dimension, refers to people who are intellectual, imaginative, broad-minded and curious. These kinds of people are tolerant of ambiguity and willing to experiment and try new things.
- 2.** Conscientiousness refers to the extent to which a person is responsible, careful, hardworking and able to plan. Conscientious people are intrinsically motivated and willing to overcome obstacles that they encounter.
- 3.** The third personality aspect is extraversion. Researchers define extroverts as talkative, assertive, adventurous and energetic. Confidence, in particular, is the dominant component of extraversion.
- 4.** Agreeableness defines the people who are good-natured, flexible, cooperative and reliable. These people are good team players because they can easily work with other people and are open to different ideas.
- 5.** The final dimension of personality is neuroticism. People who are high in neuroticism are defined as anxious, emotional, defensive and sometimes depressed (Mohammed and Angell,

2003; Peeters et al, 2006; Van Vianen and De Dreu; 2001; Phillips and Loyd, 2006; Taggar, 2002).

1.3 PERSONALITY IN TEAMS

Diversity is defined as the "distribution of personal attributes among interdependent members of a work unit" (Jackson, Joshi and Erhardt, 2003:802). It includes factors such as: age, gender, ethnicity, knowledge, skills and personality differences. Many researchers tend to divide these personal attributes into two groups which are called surface and deep level diversities (Phillips and Loyd, 2006). While surface level diversity includes demographic factors such as age, gender and ethnicity, the deep level diversity factors include knowledge, skill set and personality traits (Harrison, Price and Bell, 1998; Phillips and Loyd, 2006).

It has been suggested that teams composed of individuals who come from different departments and have different knowledge bases as well as viewpoints depending on their demographic backgrounds, may lead to creative and innovative outcomes (Erhardt, 2010; Sapsed, 2002). The idea behind these assumptions is that the diverse combination of knowledge bases and viewpoints could facilitate new knowledge creation and foster innovation in teams. (Hobbbday,1998; Nonaka and Konno, 1998; Harrison and Klein, 2007). However, other factors may also have an impact on team performance such as contextual or personality diversity factors (Keck, 1997; Ancona and Caldwell; 1992; Mohammed and Angell, 2003).

The increase of team based structures in organizations necessitatates careful consideration on the process of team formation (Halfill et al, 2005). What is more, the workforce diversity in organizations is also becoming popular and therefore individuals with different backgrounds,

ethnicities, personalities interact and cooperate together (Philips and Loyd, 2006). As a result of such developments decisions and strategies related to composition of teams is becoming vital particularly for organizations that invest on team work and expect high effectivity from the teams. To put it differently, it is crucial for agencies to gather right composition of individuals in teams for effective and innovative outcomes (Betcholdt et al, 2006).

Research on team composition showed that along with demographic diversity, personality diversity within teams may also influence performance of teams (Mohammed and Angell, 2003, Peeters et al, 2006). Conscientiousness has become a significant predictor of team performance (Barrick, Stewart, Neubert, & Mount, 1998; Neuman and Wright, 1999; Neuman, Wagner and Christiansen, 1999; Mount, Barrick and Stewart, 1998). Apart from conscientiousness, agreeableness (Neuman and Wright, 1999), extraversion (Barry and Stewart, 1997) emotional stability - in other words low-level neuroticism (Mount, Barrick and Stewart, 1998) and openness to experience are also associated with positive outcomes (Lepine, 2003; Taggar, 2002; Baer, Oldham, Jacopsohn and Hollingshead, 2008). Such that the Big Five constructs being talked about has become most influential in terms of teamwork (Muchisky, 2006; Neuman and Wright, 1999).

However, it is also important to mention that the nature of the task that the teams deal with also has an effect on team composition and performance outcomes (Peeters et al, 2006; De Dreu and Vianen, 2001). Hence, for instance, when it comes to teams that are responsible for complex tasks requiring creativity and/or innovation, the results may be different from other teams that have more identifiable developmental duty (Neuman et al; 1999). In fact, some researchers found negative correlation between conscientiousness and creativity-oriented tasks

(Robert and Cheung, 2010). In addition, in some cases, a curvilinear relationships have been found or predicted between traits as agreeableness, extraversion and group performance (Barry and Stewart, 1997; Betchtold et al, 2007). As can be inferred, there are still gaps in team composition research and there is a need for more research that principally links team creative performance, innovation and members' personality (Bechtoldt et al, 2007; Neuman et al; 1999; Litchfield et al, in press). Additionally, further research is needed on team composition, performance and personality relationship in different contexts (Mohammed and Angell, 2003).

CHAPTER.2: RESEARCH METHODOLOGY

2.1 INTRODUCTION

This chapter will firstly introduce two dominant research paradigms in management and work psychology related research. Based on the explanation and comparison of these two differing approaches, the reason for adopting a methodology for this research will be explained. Finally, the chapter ends with the information about ethical considerations for both studies conducted for the creation of this thesis.

2.2 RESEARCH APPROACH AND PHILOSOPHICAL ASSUMPTIONS

There are two main paradigms that dominate the social science and therefore management and organisational psychology related studies. Although there is no consensus among researchers regarding how to name these approaches, interpretivism and positivism are the ones most used (Bryman and Bell, 2003). These two paradigms are divided into 3 aspects based on their assumptions regarding the nature of reality (ontology), the nature of knowledge within this reality (epistemology), and the way of reaching that knowledge (method). In fact, it is claimed that a qualified research design should embrace the researcher's choices regarding these assumptions (Sunner and Tribe, 2004; Guba and Lincoln, 1994). The interpretivism bases its ontological stance on socially constructed reality (relativism). Therefore, the main epistemological assumption is that truth and the knowledge are constructed by the individuals within a particular context (interpretivist epistemology). Having this epistemological view in hand, interpretivists mostly use qualitative methods as interviews, observation etc., to reach a

knowledge through understanding perceptions of the actors who construct the reality in that specific context. On the other hand, the positivist stance rests upon as realistic ontological premises which assume that the existence of the society is concrete and free from the social actors (realism). Following this, the epistemological view of positivists can easily be represented by a natural scientist who takes an objectivist stance and conducts investigations on observable social reality through avoiding any bias or influence on outcome and aims to generate law-like generalisations (objectivism) (Hassard, 1991; Remenyi et al, 1998).

To this end, in present research for both studies positivist paradigm is adopted. Therefore, I have a realist view on social entities and my assumption is that these entities have an external reality, and, in line with the realist ontological stance, the epistemology of this research will be objectivism. According to objectivism, methods used in natural sciences can be applied to social sciences (Johnson and Duberley, 2010) and quantitative methods can be used based on this assumption (Easterby, et al, 2008). In other words, the main approach of positivist research is to build theories by observing cause and effect relationships in social reality, develop hypotheses based on the theories and test these assumptions to reach generalisable empirical results (Bryman and Bell, 2008). In this research project the focus will be on reaching empirical generalisations and verifying causal effects between personality traits, innovation and creativity related group processes and team outcomes (Bryman, 2012). Positivist approaches and quantitative methods will underpin the methodology of this research in order to explain the nature of the relationships between highlighted variables and to contribute to the body of knowledge developed in management and work psychology domains.

2.3 RESEARCH DESIGN

This thesis consists of two distinct studies that evaluate the relationship between personality composition, team processes and team creativity (study 1) and innovative (study 2) performance.

The main focus of the first study is to shed light on the association between team personality configuration and creative performance using student teams. Therefore, this study will contribute to the team personality composition and team creativity research fields whilst exploring the relationships between personality traits and team creative performance variables.

Study two has more variety with regards to the organisations involved, a larger number of teams and participants surveyed, and also examines more variables. The focal point of study 2 is to understand the direct or mediated influence of personality composition on team innovative performance in firms whose main focus is to innovate through knowledge worker teams. Specifically, by way of this latter study, the relationship between both bright and dark side personality traits, innovation related team processes and team innovative performance will be examined. To this end, the study aims to bring additional arguments to the team innovation literature and extend the scope of the IPO model of team innovation through highlighting the influence of personality and process dimensions of teamwork.

This thesis was designed to examine the role of personality on team creative and innovative performance in two distinct settings. To understand the direct personality and team creative performance student team setting is utilized. The teams in both settings have different characteristic features. These differences may be due to a number of aspects. In comparison with the professional work teams (KWTs) student teams are expected to have less teamwork

experience, operate in short time period and less interdependent (Peeters et al, 2006). Additionally, while the chosen student team context (in other words the module design) was appropriate for measuring creative performance whereas the other knowledge intensive R&D context was suitable for assessing the innovative performance of knowledge worker teams. As a result, conducting research on the role of personality on team creativity and innovation, allowed to examine the relationship in distinct team settings with comparatively different characteristic features as well as reaching more generalisable results.

Table 2.1: Comparison of the Features and Scopes of Both Studies Conducted in Distinct Contexts

	<u>Study 1</u>	<u>Study 2</u>
<u>Characteristic Features</u>	<u>Student Teams</u>	<u>Knowledge Worker Teams</u>
<i>Characteristic Features in General Based on the Team Type.</i>	-Less team experience -Operate in short time period -Less interdependency among members -Creativity oriented task	-More team experience -Operate in longer time period -Higher interdependency among members -Innovation oriented task
<u>Inputs</u>		
<i>Big Five Personality Traits</i>	✓	✓
<i>Dark Triad Personality Traits</i>		✓
<u>Outputs</u>		
Team Innovative Performance		✓
Team Creative Performance	✓	
<u>Team Processes</u>		
<i>Participative (Psychological) Safety</i>		✓
<i>Task Focus</i>		✓
<i>Shared Objectives</i>		✓
<i>Support for Innovation</i>		✓
<i>Task Conflict</i>		✓

<i>Team Communication</i>		✓
<i>Team Cohesion</i>		✓
<i>Participative (Psychological) Safety</i>		✓
<u>Analyses</u>		
<i>Direct Relationship Between Personality Traits and Team Creative Performance</i>	✓	
<i>Direct Relationship Between Personality Traits and Team Innovation</i>		✓
<i>Mediated Relationships between; Personality traits – team processes – team innovation</i>		✓
<i>Moderated Relationships between; Personality traits (mean level) – moderating team processes (variability level) – team innovation.</i>	✓	✓

2.4 METHODS AND SAMPLES

The nature of the research questions and the embraced positivist paradigm informed the adoption of quantitative methods for both studies conducted in this thesis. In other words, quantitative approach was applied for gathering information in order to address the research questions. Accordingly, the chosen method determined the following data collection and data analysis actions (Saunders, Lewis and Thornhill, 2012).

Data for the Study 1 was gathered from undergraduate students operating in teams while Study 2 was conducted with knowledge workers working in teams. In accordance with the research

design and approach endorsed in this thesis, survey questionnaires were used as a data collection tool in order to collect data from team members for both studies. In addition, Creative and innovative performance of teams were assessed by external judges (the module leader in study 1, and managers in study 2).

After the collection of self-reported surveys questionnaires and the assessment provided by external judges the data was coded and analysed through using SPSS software. Multiple regression analysis was used to analyse both data sets. Specifically, regression analyses were used for direct association hypotheses. Additively, mediated and moderated regression analyses were also utilised in order to test mediated and moderating hypotheses respectively.

Moving on to the samples, the sample of the initial study was composed of undergraduate students taking a module that requires to operate in teams for a creative task. On the other hand, the sample of the second study comprised by knowledge workers, who are highly qualified employees and have specific work related expertise operating in teams to accomplish innovation related tasks in R&D organizations in Turkey. Data was collected based on an accessibility criteria in both studies and through using non-probability purposive sampling as this type of sampling allows the researcher home in on the samples which are believed to be critical for the research (Denscombe, 2007). In this regard, Patton (1990) underlined that: “the logic and power of purposeful sampling lies in selecting information-rich cases for study in depth. Information rich cases are those which one can learn a great deal about issues of central importance to the purpose of research” (p. 169). Therefore, conducting the studies in distinct contexts allowed me to examine the role of personality not least on team creativity (study 1) and innovation in knowledge intensive settings (study 2).

The information has been provided so far is about the chosen research design; methods, analysis strategies and samples that are utilized in order to answer the research questions introduced in this thesis. However, it is worth noting that details of the methods, analysis processes and the nature of samples in each study will be set in chapter 3 and 4.

2.5 ETHICAL CONSIDERATION

Informed consent was used in both studies conducted and for all the data collected through questionnaires. Additionally, the participants were informed and guaranteed regarding the privacy of the data, involvement rights and potential use of data (Saunders et al, 2007). Confidentiality was also guaranteed to the organisations and no covert activities took place in this research. The two studies presented in this thesis are prepared and implemented on the basis of Research Ethics Policy of the University of Sheffield. The subject, design, methodology and the scope of both studies were approved before the data collection phase of the research by the University of Sheffield Management School research ethics reviewers. The approval letters can be found in the appendices section B.

CHAPTER.3: STUDY 1- STUDENT TEAM

PERSONALITY COMPOSITION AND CREATIVITY

3.1. INTRODUCTION

In this chapter, the focus will be on the relationship between personality composition and creative performance of student teams. This chapter starts with an introduction to the extended input-output model of creativity. Drawing on this model, the input (big five personality traits), and output (creative performance) variables will be introduced. This chapter will continue with the development of the research hypotheses in terms of the relationship between these variables. Thereafter, the predicted relationships will be tested and presented in the results section. Finally, this chapter will finish with a discussion on the relationships amongst input-process-output variables.

The aim of this study is to understand the relationship between team personality composition and creative performance. Big five personality trait scales are used to measure the personalities of team members. Recent research shows that group work can be extremely beneficial in producing creative outcomes in the right conditions (Sutton, Hargadon; 1996; Rietzschel, De Dreu and Nistad, 2009; Hoeghl and Gemuenden, 2001). Therefore, this research will examine both the mean and variability level influences of personality composition on teams' creative efforts.

There are a considerable number of studies that investigate the relationship between personality and general team performance (Mount, Barrick and Stewart, 1998; Van Vianen, De

Dreu, 2001, Quigley and Gardner, 2007). However, the association between personality traits and the creative performance aspect of teams needs more attention (Myriam *et al.*, 2007). There are only a few studies that analyse this relationship (Litchfield, Gilson, Shalley, in press). However, this study diverges from previous ones through its investigation of the relationship between mean and variability levels of personality and creative performance of student teams over a short time period.

Currently, more and more teams are only designed for the short term, to find a solution to a problem or hold a cooperative project (Tannenbaum, Mathieu, Salas and Cohen, 2012). Hence the need to understand group dynamics and examine creative performance in the short term is becoming important. In this regard, examining not only the influence of mean level personality, but also the moderating role of personality diversity on the relationship between mean level personality traits and team creative performance, is the main motive of Study 1.

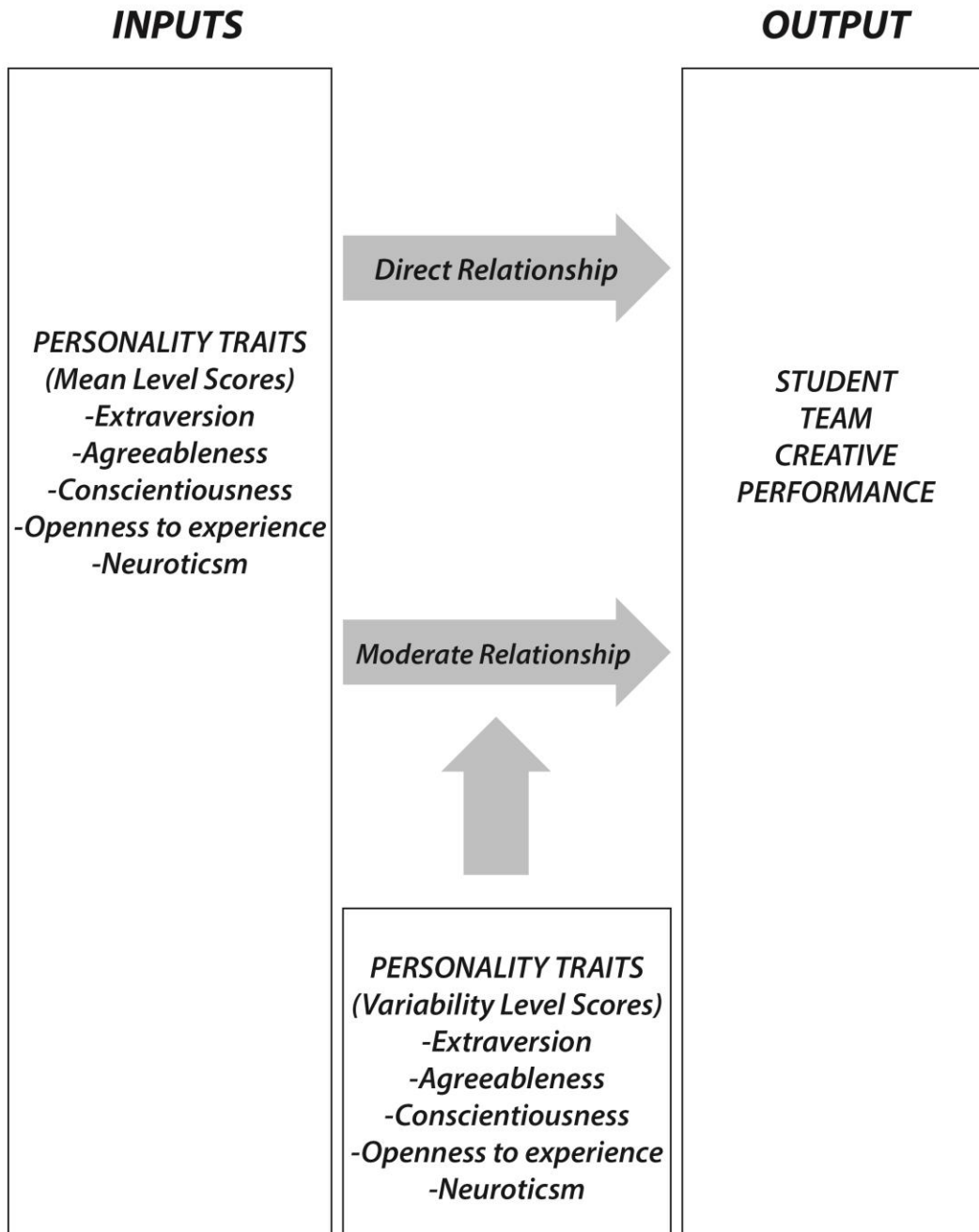
3.2. INPUT-OUTPUT MODEL OF TEAM CREATIVITY

This model conceptualises the relationship between both mean and variability levels of big five personality and team creative performance. As depicted in figure 3.1, there are two different levers of relationship that will be covered in this research.

- *The first lever is the direct relationship between mean levels of each Big Five personality traits and team creative performance. In this regard, the direct association between outputs and inputs is the initial focus of study 1.*

- *The second lever focuses on the moderating role of variability in Big Five personality traits on the relationship between mean level personality traits and the creative performance of student teams. Therefore, the second lever of the model represents a more complex association. It considers not only the effect of mean level personality on team creative performance, but also the moderating impact of personality diversity on a relationship.*

Figure 3.1: An Extended Input - Output Model of Student Team Creativity



3.3. INPUT: STUDENT TEAM PERSONALITY VARIABLES (BIG FIVE PERSONALITY TRAITS)

This initial research will focus on the effects of personality factors on student teams. Personality factors can be categorised in many ways. However, as is widely accepted, utilised and researched, Costa and McCrae's the "Big Five" model of personality factors, namely openness to experience, conscientiousness, extraversion, agreeableness and neuroticism can be representative in a research project (Costa, McCrae, 1988).

Pervin (1980) defines personality as "individuals' unique and stable pattern of thinking, feeling, acting and reacting to his or her social environment" (cited in Bechtoldt, Dreu and Nijstad; 2007). Every individual's personality can be described with one of the big five personality factors; these factors will be used in this research (Peeters, Van Tuijl, Rutte and Reymen; 2006).

The first personality trait of the big five personality approach is extraversion. Researchers define extroverts as talkative, assertive, adventurous and energetic. Confidence, particularly, is the dominant component of extraversion (Phillips and Loyd, 2006). These types of individuals are well known for with their communication skills and dominant characteristics, as they can easily engage in conversations with others, as well as being self-confident and assertive (Costa and Mcrae 1988). Having positive (communicative tendency) and negative (dominance and assertiveness) together, researchers expected curvilinear relationships between extraversion and team performance, and favoured variability in extraversion (Barry and Stewart, 1997, Peeters *et al*, 2006).

The second big five personality trait is agreeableness. Agreeableness defines people who are good-natured, flexible, cooperative and reliable. These people are good team players because they can easily work with other people (Peeters *et al.*, 2006). Therefore, there are a considerable number of studies that indicate the positive and contributive role of agreeable individuals within teams. Although agreeableness is perceived as a constructive characteristic in a team context, their crucial role may depend on the type of the task that team has. In other words, the agreeable and conflict-solving nature of these individuals may not have a powerful influence on a particular creative outcome because creativity is nurtured by task-related conflicts and the generation of alternative ideas (Baer *et al.*, 2008).

Thirdly, conscientiousness refers to the extent to which a person is responsible, careful, hardworking and adept at planning. Conscientious people are intrinsically motivated and willing to overcome obstacles that they encounter (Taggar, 2002). In fact, this characteristic is similar to agreeableness within teamwork-related literature. Once again, conscientiousness is another trait whose positive influences are mostly supported by research findings, particularly when general team performance is of concern. However, these individuals generally take responsibility for accomplishing the task in hand, rather than generating alternative and innovative ways of doing things (Robert and Cheung, 2010).

The fourth trait is neuroticism. Neurotic individuals are defined as anxious, emotional, defensive and sometimes depressed (Mohammed and Angell, 2003). Drawing on these definitions, neurotic individuals are generally conducive to negative outcomes within the contexts of both organisation and team work (Van Vianen and De Dreu; 2001), since, in a team context, cooperation and inter-relationships among individuals are seen as crucial factors (Hackman,

2009). As a result, these individuals are generally unfavourable in terms of positive creative outcomes in team levels (Bolin and Neuman, 2006).

The final and most creativity-oriented trait is openness to experience. This trait refers to people who are intellectual, imaginative, broad-minded and curious. This kind of individual is tolerant of ambiguity and willing to experiment and try new things (Schilpzand, Herold and Shalley, 2010). Creativity-oriented teams need to be composed of members who are not only creative themselves, but must also be open to alternative ideas and have the ability to build upon other members' contributions so that novel and useful ideas can flourish (Baer *et al.*, 2006). In fact, individuals who are highly open to new experiences are considered to have both skills mentioned above, and therefore some scholars argue that they can play an active role in the overall performance of creative teams (Reilly, Lynn, Aranson, 2001; Litchfield, forthcoming).

3.3.1. Personality Composition and Creativity in Teamwork

Organisations play a vital role within today's society and, along with technological developments, globalisation and new sociological dynamics, have an influence on organisations, the environment(s) in which they run, and on their operating styles. As a result, they need to react to the changes within the environment, compete wisely and build productive relationships with stakeholders. Indeed, the present day problems that organisations face are much more complex than in the past. Developing creative competencies is accepted to be the key factor in dealing with the issues of today's work environment (Hill and Amabile, 1993). In addition, single individuals do not hold all the relevant knowledge and skills to deal with complex issues and individual job descriptions are being replaced with team structures to collaborate on

distinct ideas and to allow creativity to flourish (Sutton and Hargadon, 1996). The importance of creativity in groups is also reflected in academia, and creativity has been examined by many researchers at the team level. Moreover, the factors that have the potential to influence group creativity have been extensively illustrated (Paulus, 2000). Personality is also recognised as one of the influencers on the creative performance of both individuals and teams (Mumford and Guftafson, 1988). However, only a limited number of studies has focused on the relationship between personality and team creativity, though recently scholars have begun to theorize on this relationship (Buchanan, 1998; Bolin and Neuman, 2006; Bechtoldt, Dreu and Nijstad; 2007; Baer *et al.*, 2008; Schilpzand, Robert and Cheung, 2010; Herold and Shalley, 2011, Litchfield *et al.*, forthcoming). Therefore, one of the focal aims of this research is to contribute to this developing area of team creativity literature.

As mentioned before, in this research, the so-called “big five” framework will be adopted as a well-known organising framework for describing personality-related traits. This framework has gained considerable attention from researchers investigating the association between personality and team performance. However, when it comes to the association between creativity and personality within the limited number of inquiries, there are only four studies in the literature that specifically probe this relationship.

First, the study conducted by Bolin and Neuman (2006) involved 309 undergraduate psychology students who were randomly placed in 78 brainstorming groups. The aim of the research was to investigate the impact of all big five personality characteristics on the creative performance of groups. This was assessed by a simple brainstorming task with no end product beyond the number of ideas generated by the student teams. The results generated significant relationships

between openness and emotional stability (low neuroticism) and creative performance, and insignificant relationships between extraversion, conscientiousness and agreeableness.

The second study, performed by Baer and co-workers in 2008, illustrated some particularly interesting findings. They also conducted their research on 507 undergraduate management students composed of 169 three-person teams. This study comprised two distinct idea generation tasks: the first involved five human resources-related problems, whilst the second task included three new product development problems. Researchers aimed to probe both the influence of personality and creative confidence gained during the completion of the first task. This research revealed the importance of creative confidence, as the only significant results related to this. Openness and extraversion and low mean levels of conscientiousness were associated with creative performance only when the creative confidence was high within the participating student groups.

Robert and Cheung conducted the next study in 2010. This study focused solely on team-level conscientiousness and its role in the creative performance of 229 student teams. The task used for assessment of the student teams was slightly more complex in comparison to the other tasks discussed here, as it required the development of basic marketing plans for novel products. The findings of this study showed a negative relationship between conscientiousness and team creative performance. Additionally, it is worth noting that mean-levels of extraversion and openness to experience were included as control variables; however, no significant relationship was found between these characteristics and the creative performance of the student teams. In this study, the researchers also aimed to find the explanatory mechanisms for the relationship between conscientiousness and creative performance. They developed hypotheses that

involved the related explanatory mediators of information sharing and systematic task processes. The research, however, did not reveal any significant findings regarding these mediators.

The final, and most recently published, study was that of Schilpzand, Herold, and Shalley (2011), who examined the association between openness to experience and the creative performance of 31 student teams. This research involved both mean and variability effects of openness on creative performance, and it revealed that although mean-level openness does not significantly relate to creative performance, variability in openness does. Therefore, this finding is supportive of the previously mentioned studies of Baer *et al.*, (2008) and Robert and Cheung (2010). The impact of variation was an unexpected finding for this study. However, the scholars concluded that teams needed at least one individual with low levels of openness in order to help the team evaluate the feasibility of the ideas generated by others (including open ones), and also reach a consensus on the best idea to follow (Schilpzand *et al.*, 2011; Litchfield *et al.*, forthcoming).

Overall, it seems that when it comes to creative performance, the role of personality is more complex and weaker than general team performance. While the findings related with openness to experience were mixed, there is a fair amount of support for the negative impact of conscientiousness and strong support for no influence of agreeableness, extraversion and neuroticism. What is more, the impact of variability of personality traits on creative performance was mostly neglected. Therefore, the present study aims to investigate the personality composition and team creative performance relationship through testing both mean and variation effects using the input-output model depicted in figure 3.1, below.

3.4. OUTPUT: CREATIVE PERFORMANCE OF A STUDENT TEAM

This section will provide emphasis on team outputs. Outputs for teams can include various factors such as productivity, wellbeing, satisfaction, innovation, etc. For the purposes of this study, the focus will be on team creative performance as an outcome. Creativity, in this context, refers to the generation of new, useful ideas and is considered a starting activity of innovation (Hulseger *et al.*, 2009).

In the present research, the output measurement will be the team-level creativity, and the focus will be on student teams operating in an enterprise and entrepreneurship module. Therefore, the number of creative ideas developed by the student teams and the novelty and feasibility of these ideas will be factors that can be used to measure creative performance (West and Wallace, 1991; Hulseger *et al.*, 2009).

There has been considerable research into the understanding of team dynamics and the importance of diversity on work team performance, as stated by Bechtoldt and co-workers (2007); the effects of personality factors on creative performance and innovativeness have received little attention, however. As discussed previously, the effective composition of a team has a considerable impact on the team's ability to perform well, and in this respect the determination of the team members' personalities is one of the most essential steps. More to the point, the tendency of an individual to act in a particular way and interact with others in an effective way is a function of his/her personality (Kichuk and Weisner, 1997). Hence, personality factors have an effect on the performance of student teams (as dynamic, less structured and interaction-oriented groups), and their creative performance can be researched. Thus, I have

conducted a research project on student teams in order to examine personality factors, and their relation with the creative performance of these teams.

The research question for study one is:

How does student team personality composition relate to the creative performance of a student team?

--- Is there any relationship between the mean level personality traits and creative performance of a student team?

--- How does variability in personality traits affect the relationship between mean level personality traits and creativity of student teams?

As a result, this study aims to contribute to the team composition and performance literature through an examination of the creative performance of student teams in the midterm period. In addition, as distinct from other studies, this study aims to probe different types of personality compositions through examining the impacts of both mean levels and variability of personality traits on creative performance. As stated above, these teams show considerable differences with teams in other contexts; hence, this study can explore new, different correlations between personality traits and creative performance, thereby contributing to the existing research while examining past assumptions with distinct tasks and personality configurations in a student team context.

3.5. DEVELOPMENT OF RESEARCH HYPOTHESES FOR STUDY 1

This part will discuss the relationships between input (personality traits), processes (innovation-related group processes) and teams' innovative performance. Additionally, the research hypotheses will also be introduced in this section.

In this first study, hypotheses are built in terms of two different aspects of team composition.

The first aspect is personality trait levels of the student teams. These levels will be determined through adding each member's scores and finding the average score for a trait for a particular team. Present research aims to investigate the relationship between high and low levels of each big five personality trait and a teams' creative performance.

The second aspect is the variability (diversity) of members' personalities in a team and its relationship with student teams' creative performance. In other words, this aspect will focus on personality heterogeneity or homogeneity in student teams and its effect on innovative outcomes. Personality heterogeneity refers to team members' differences in personality. In contrast, personality homogeneity refers to the similarities of team members in personality (Mohammed and Angell, 2003; Glomb and Welsh, 2005). To this end, expectations about the effects of personality trait levels and team members' personality variability on student teams' performance will be discussed in this section.

3.5.1 Extraversion:

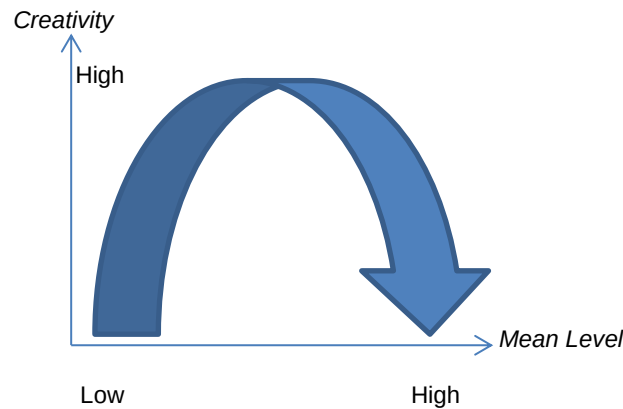
People who are highly extraverted can be described as sociable, energetic, talkative and expressive (Costa and McCrae, 1992; Becholdth *et al.*, 2007). As can be understood, extroverts are good at starting and fostering communication among team members (Bradley and Hebert,

1997). However, the results of the investigations illustrate the damaging impact of too much elevation of the level of extraversion within the groups. It has been claimed that the high level of communication comes with a considerable level of 'chat' that may distract the members' focus on the tasks actually at hand (Neuman *et al.*, 1999). Conversely, too low a level of extraversion may result in weak idea exchange and communication, and is therefore not favoured (Baer *et al.*, 2008). Interestingly, investigations on the relationship between personality traits and creative performance have revealed no significant findings that state relevance among these factors (Bolin and Neuman, 2006; Baer *et al.*, 2008; Robert and Cheung, 2010). However, there is strong support, both from a theoretical and research point of view, that extroverts facilitate idea-sharing processes, and having a reasonable level of extraversion within teams is likely to create positive results (Costa and McCrae, 1992; Barry and Stewart, 1997; Barrick *et al.*, 1998; Van Vianen and De Dreu, 2001). Therefore, a curvilinear-level relationship between extraversion and creativity is predicted. In other words, I expect positive relations between moderate levels of extraversion and creativity, and negative relationships between low- and high-level extraversion and the creative performance of student teams.

Thus, the first hypothesis is:

H1a: The mean level of extraversion has a curvilinear (∩-shaped) relationship with student team creative performance, such that the highest performance will be at a moderate level of extraversion.

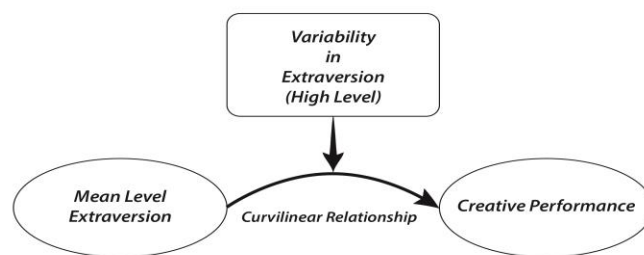
Figure 3.2: Expected curvilinear relationship between mean level of extraversion and creative performance



Moving on to the moderated relationship between mean level of extraversion, variability in extraversion and creativity, to foster communication, trust and sharing among members, teams need some extraverted members (Stewart, Barrick and Piotrowski, 2000; Neuman *et al.*, 1999; Litchfield, Gilson and Shalley, in press). Thus, in theory, having a low level of extraversion within a team is not favourable. In fact, scholars argue that teams definitely need formal and informal communication and idea exchange for creativity to flourish, and extroverts are seen as key to facilitating conversation within groups (Taggar, 2002). Taking the argument further, low, moderate or high levels of variability in extrovert members is not expected to result in a considerable change in the relationship. Since the total extraversion level is low, so the communication and interaction is low within the team, no matter how variable the team is. On the other hand, the opposite situation, which is having a high level of extraversion within the team, is also not supported. Researchers pointed out that, besides being talkative, extroverts tend to be assertive as well as dominant. Therefore, inclusion of too many extrovert members

may cause harmful conflicts within teams (Mohammed and Angell, 2003; Kichuk and Wiesner, 1998; Mazur, 1973). Having too much assertiveness and dominance in hand once again bears out claims that the level of variability (low, moderate or high) within the team is not expected to have a significant influence on the negative relationship between a high level of extraversion and creative performance.

Figure 3.3: Variability in extraversion is moderating the relationship between mean-level extraversion and team creative performance



Considering the arguments above, a moderate level of extraversion within the team is expected to be positively related to team creativity because in these types of teams there is no expectation of a significant level of harmful conflict or weak communication arising. Additionally, if a moderate level of extraversion interacts with high variability in extraversion, this moderated interaction is predicted to have the most positive effect on creativity. Since high variability in extraversion is also expected to be positively related to creativity in this research, it is argued that successful teams will be those that include a variety of extroverts with different levels. In other words, there should be some introverted members, as well as extroverts, within the teams (Neuman *et al.*, 1999). Another claim is that introverts are adept at having holistic views about

their teams - reflecting and assessing the teamwork they are involved in, and these features can indeed be beneficial for teams in terms of solving complex problems and making decisions (Bradley and Hebert, 1997). Considering the arguments above, in present research, a high level of variability in extraversion is favoured, whilst low-level variability is not supported as there won't be any influencing extroverts who foster interaction. In fact, findings also support these arguments. In their research, Barry and Stewart (1997) found a curvilinear relationship between the proportion of extrovert group members and group performance. Another investigation by Neuman and co-workers (1999) also reveals a positive relationship between heterogeneity in extraversion and group performance. Therefore, having an average level of extraversion and high variety of members from almost all levels of extraversion is expected to be positively related to creative performance. In this regard, *Team B (shown in red in the figure below)* represents an ideal example of a team type that has a moderate mean level and high variability in agreeableness.

The second predicted hypothesis is:

H1b: The curvilinear relationship between mean level of extraversion and student team creative performance is moderated by variability in extraversion, such that the association between a moderate mean level of extraversion and innovative performance is most positive when the variability in extraversion is high.

Figure 3.4: Team Types Based on Their Mean Levels and Variabilities in Extraversion

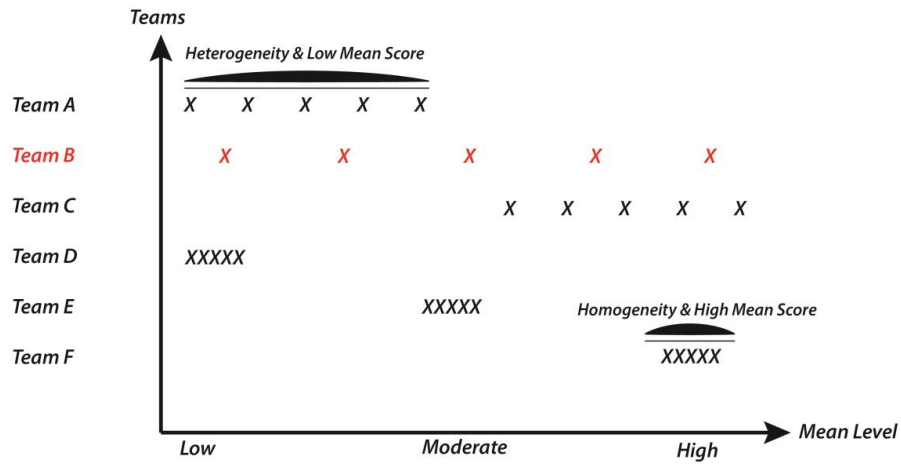


Table 3.1: Explanations of performance expectations of team types based on the mean and variability levels of extraversion

<u>TEAMS</u>	<u>LEVEL</u>	<u>VARIABILITY</u>	<u>CREATIVITY</u>	<u>REASON</u>
A	<i>Low</i>	<i>High</i>	<i>Low</i>	Low level of extraversion within the team jeopardises the information flow among members since there is no extrovert member who will be the facilitator of formal and informal transaction. Strong variance among members is considered as beneficial. However the average level of extraversion is low so the expectation is weak impact on the relationship between mean level of extraversion and creativity.
B	<i>Moderate</i>	<i>High</i>	<i>High</i>	This team is expected to be the best performer in terms of creativity. Because there will be adequate level of communication and low dominance so no dysfunctional conflicts. Having High level of variability within team in terms of extraversion is also considered as good for the team to be able to reach the right harmony for the creativity.
C	<i>High</i>	<i>High</i>	<i>Low</i>	High level of extraversion is also not favoured within the teams because extraversion comes with the dominant characteristics and these cause dysfunctional conflicts within teams. Additionally, in high level of extraversion situations too much talk is expected and this may inhibit the team's focus on creativity. As mentioned above high variability is seen as positive yet the average level of extraversion is high within the team thus there won't be a strong influence on the relationship between variability and creativity.
D	<i>Low</i>	<i>Low</i>	<i>Low</i>	The mean level of extraversion is low and also variability is low which is not seen as promising situation for the creative performance.
E	<i>Moderate</i>	<i>Low</i>	<i>Low</i>	Although the mean level is moderate, the team is highly homogeneous in terms of extraversion that is not a favourable situation for creative performance.

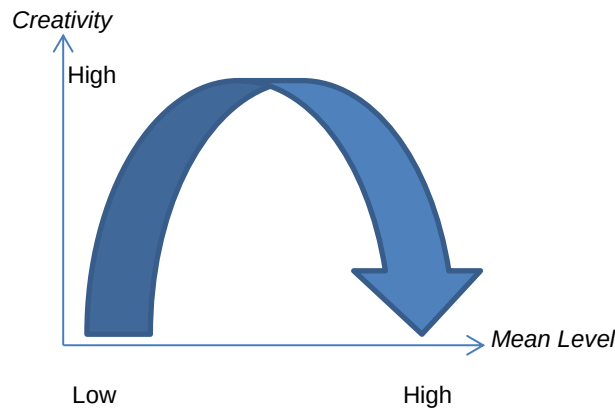
F	<i>High</i>	<i>Low</i>	<i>Low</i>	In this team, once again the mean level is high and variability is low hence creativity performance is expected to be low.

3.5.2 Agreeableness:

Agreeable people are decent and cooperative people who lower tensions in teams and facilitate cooperative work among members (Stewart, Fulmer and Barrick, 2005). Findings endorse this theory, and further show that agreeable members have a positive impact on teams and their performance (Barrick *et al.*, 1998; Graziano *et al.*, 1997; Neuman *et al.*, 1999; Neuman and Wright, 1999; Van Vianen and De Dreu, 2001). However, when it comes to creative performance, research often shows that novel ideas tend to be created by having task-related conflicts within the team, yet the confirmatory nature of agreeable people is contrary to these findings (De Dreu and West, 2001; De Dreu, 2006; Jehn, 1995). Thus, high levels of agreeableness may not be beneficial for teams that aim for high creativity. At the other extreme, teams with a high disagreeability rate are unlikely to create psychologically safe environments, which are known as one of the key triggers for idea sharing in teams (Edmondson, 1999; West ,2012). Having these results in hand, neither high nor low levels of agreeableness can be expected to be positively related with creative performance. Instead, the prediction favours a curvilinear relationship between agreeableness and team creativity. Therefore, the first hypothesis is:

H2a: The mean level of agreeableness has a curvilinear (∩-shaped) relationship with the creative performance of student teams, such that the highest performance will be at moderate levels of agreeableness.

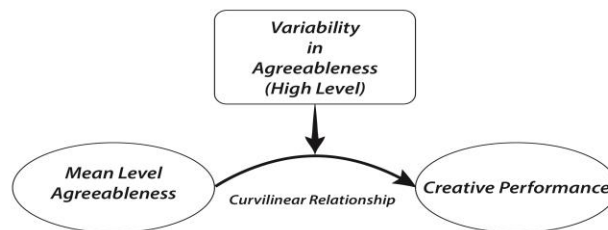
Figure 3.5: Expected curvilinear relationship between mean level of agreeableness and creative performance



To this end, this research claims that a moderate mean level of agreeableness is positively associated with creativity. Since the expectation is that teams with a low mean level of agreeableness may have a lot of disagreeable members, and thus suffer conflicts and weak cooperation; on the other hand, highly agreeable teams may confront with high cohesion, less task-related conflict and groupthink, which are also seen as detrimental to group creativity (Jehn, 1995; Bechtoldt, De dreu, Nijstad, 2007). However, in average agreeability teams, members will have all levels of agreeableness, and this is expected to result in the best creative outcome. In other words, when it comes to creativity, having both agreeable and disagreeable members is treated as being beneficial, instead of one type dominating the team. The reason for this is that agreeable members are good at facilitating team functioning and triggering cooperation and a safe climate (Stewart *et al.*, 2005). Per contra, less agreeable members can challenge ideas and are less likely to conform easily, so that teams can have constructive conflicts. Indeed, this type of conflict is seen as essential for idea generation and elaboration, which leads to creative synergies within teams (Baer *et al.*, 2008). In other words, having both

agreeable and disagreeable members within teams leads to high variability in agreeableness, which may be positively associated with creative performance. Research findings regarding agreeableness and creativity tend to associate disagreeableness more than agreeable characteristics with creativity owing to the sceptical and vocal nature of disagreeable people (Hunter and Cushenbery, 2014; Nemeth, 1986; LePine and Van Dyne, 2006). However, this does not mean that teams who focus on creativity need be comprised of only disagreeable members.

Figure 3.6: Variability in agreeableness is moderating the relationship between mean-level agreeableness and team creative performance



In fact, some researchers support this argument and predict heterogeneity in agreeableness when the creative performance is the matter at hand, because whereas some members who are high in agreeableness foster a safe and friendly climate, those who are low in agreeableness dare to engage in task-related conflicts and voice their concerns regarding problematic issues (Bechtoldt *et al.*, 2007). Considering the theory and the arguments above, the prediction is that a moderate level of agreeableness will have the most positive influence on the relationship

between high variability in agreeableness and creative performance. *Team B* (shown in red in the figure below) matches the expectations with regards to mean and variability in agreeableness. The second hypothesis:

H2b: The curvilinear relationship between mean level of agreeableness and student team creative performance is moderated by variability in agreeableness, such that the association between moderate mean level of agreeableness and creative performance is most positive when the variability in agreeableness is high.

Figure 3.7: Team Types Based on Their Mean Levels and Variabilities in Agreeableness

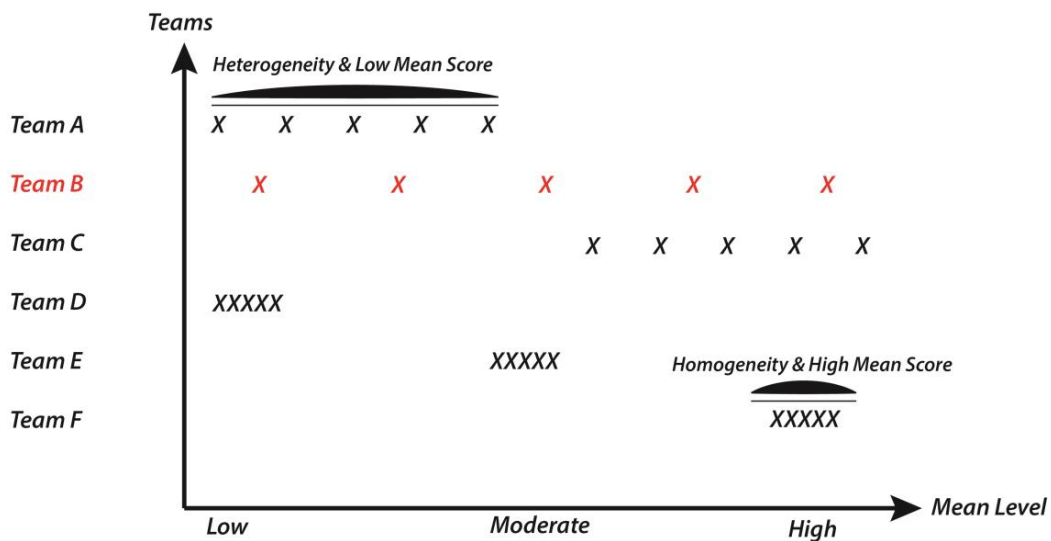


Table 3.2: Explanations of performance expectations of team types based on the mean and variability levels of agreeableness

<u>TEAMS</u>	<u>MEAN LEVEL</u>	<u>VARIABILITY</u>	<u>CREATIVITY</u>	<u>REASON</u>
A	<i>Low (-)</i>	<i>High (+)</i>	<i>Low</i>	A low level of agreeableness within the team jeopardizes the cooperation and knowledge sharing among members. Since there will be no agreeable member who facilitates formation of trust among members, as well as increasing the psychological safety in the team Strong variance among members is considered as beneficial. However the average level of agreeableness is low so the expectation is weak impact on the relationship between mean level of extraversion and creativity.
B	<i>Moderate (+)</i>	<i>High (+)</i>	<i>High</i>	This team is predicted to be the best performer in terms of creativity. Because there will be adequate level of cooperation trust and constructive task related conflicts within the team A high level of variability within the team in terms of agreeableness is also considered as positive for the team to be able to reach the right harmony through having adequate level disagreeable agreeable members for the creativity.
C	<i>High (-)</i>	<i>High (+)</i>	<i>Low</i>	A high level of agreeableness is also not favoured within the teams because agreeableness comes with the confirmative and less conflict-oriented nature and these characteristics can cause dysfunctional level of cohesion groupthink and weak minority dissent in the team. High variability in agreeableness is seen as positive yet the average level of agreeableness is high within the team thus there won't be strong impact on creativity.
D	<i>Low (-)</i>	<i>Low (-)</i>	<i>Low</i>	The mean level of agreeableness is low and also variability is low which is not seen as promising situation for the creative performance.
E	<i>Moderate (+)</i>	<i>Low (-)</i>	<i>Low</i>	Although the mean level is moderate, the team is highly homogeneous in terms of agreeableness which is not a favourable situation for creative performance.

F	<i>High</i> (-)	<i>Low</i> (-)	<i>Low</i>	In this team once again, the mean level is high and variability is low hence creativity performance is expected to be low.

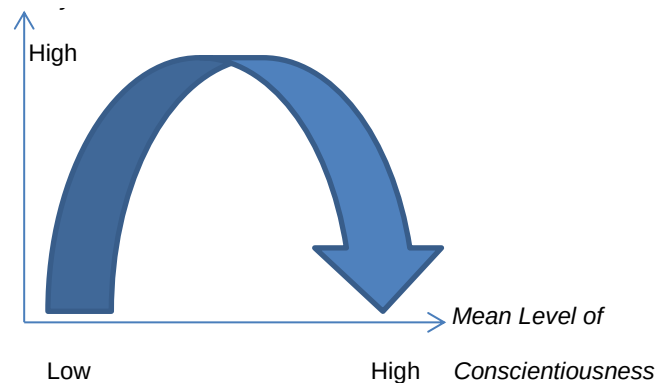
3.5.3 Conscientiousness:

Conscientious individuals are responsible, careful, hardworking and self-disciplined people. Therefore, these people are considered to be highly important for teams to accomplish their tasks (Taggar, 2002; Lepine, 2003 and Molleman, 2004). However, because these members are highly task-oriented people, they tend to hold to the established ways of doing things (Lepine, 2003), and abstract parts of team working (like idea generation) may not attract these individuals. Therefore, teams with high levels of conscientiousness may not perform well in terms of creativity. In fact, some researchers have found that a low level of conscientiousness is positively related to creative performance (Baer *et al.*, 2008). Moreover, in their research on student teams composed to develop novel products, Robert and Cheung (2010) focused on team-level conscientiousness and found a negative relationship between conscientiousness and creativity. However, as mentioned above, these individuals are highly important for teams to achieve their targets; furthermore, the creative performance of teams is not only composed of idea generation but also idea selection. Additionally, Teresa Amabile (1988) claims that selection of the final idea may need some evaluation of ideas but, unfortunately, the studies mentioned above did not investigate such activities (Litchfield *et al.*, in press). Therefore, given the critical role of conscientious members in teamwork and achievement of targets, it would be immature to completely neglect and significantly reduce mean levels of conscientiousness in teams. Based on these arguments, in this research I do not expect high creativity from teams that have either high or low levels of conscientiousness. The prediction is a positive effect due

to moderate mean levels of conscientiousness on creative performance. Stated briefly, a curvilinear relationship is expected between conscientiousness and the creative performance of student teams. Thus, the first expected hypothesis is:

H3a: The mean level of conscientiousness has a curvilinear (∩-shaped) relationship with student team creative performance, such that the highest performance will be achieved at a moderate level of conscientiousness.

Figure 3-8 Expected curvilinear relationship between mean level of conscientiousness and creative performance



With regards to the relationship between mean levels of conscientiousness and creativity, as moderated by a variability score of conscientiousness, theory and research do not significantly favour conscientiousness in teams when it comes to being creative (Baer *et al.*, 2008; Robert and Cheung, 2010). However, there has been no significant investigation into the variability aspect of the relationship between conscientiousness and team creativity. It is claimed that the

importance of having heterogeneity in conscientiousness, in terms of the need for idea selection, evaluation and combination for effective creative performance, may be essential (Litchfield, Gilson and Shalley, in press). In addition, Buchanan (1998) revealed the positive impact of conscientiousness members on a team's creative performance as long as there is a moderate level of extraversion and high levels of openness within the team. Considering the theoretical background and arguments of previous researchers, I would claim that conscientious, homogeneous teams are likely to fall behind in terms of the idea generation part of the creativity, while teams without conscientious members will lack responsibility in terms of reaching the core mission. Therefore, having a variety of members from almost all mean levels (high, moderate, low) of conscientiousness may generate the correct harmony and composition for creativity. Considering the prior literature and arguments, the prediction is that high variability in conscientiousness will have the most positive impact on the relationship between moderate mean level of conscientiousness and creative performance. *Team B* (shown in red in the figure below) is representative of the ideal type of team in terms of both mean levels and variability in conscientiousness.

The second hypothesis is:

H3b: The curvilinear relationship between mean levels of conscientiousness and student team creative performance is moderated by variability in conscientiousness, such that the association between moderate mean levels of conscientiousness and creative performance is most positive when the variability in conscientiousness is high.

Figure 3.9: Variability in conscientiousness is moderating the relationship between mean level conscientiousness and team creative performance

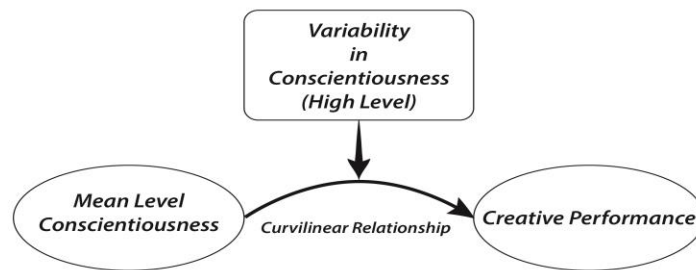


Figure 3.10: Team Types Based on Their Mean Levels and Variabilities in Conscientiousness

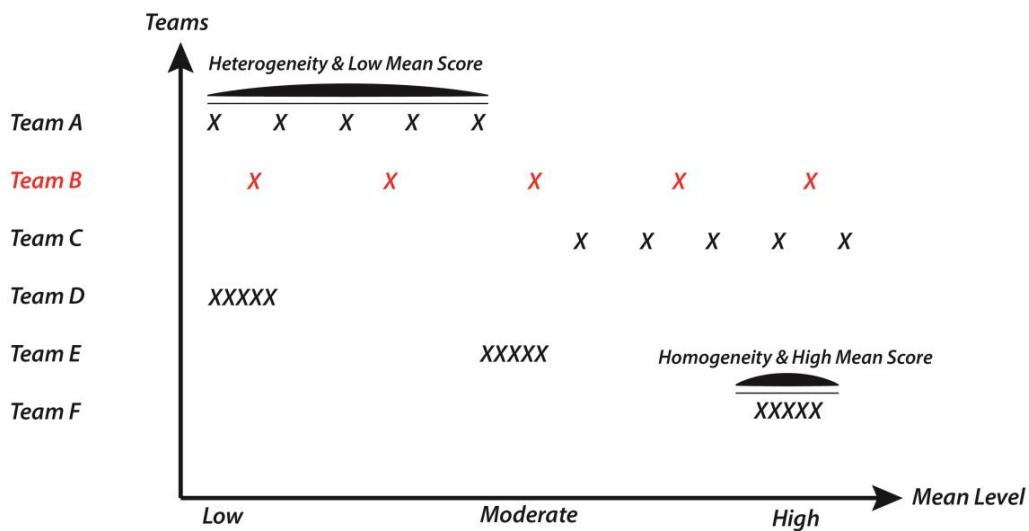


Table 3.3: Explanations of Performance Expectations of Team Types Based On the Mean and Variability Levels of Conscientiousness

<u>TEAMS</u>	<u>LEVEL</u>	<u>VARIABILITY</u>	<u>CREATIVITY</u>	<u>REASON</u>
A	<i>Low (-)</i>	<i>High (+)</i>	<i>Low</i>	Low level of conscientiousness within the team may cause reduction on the task cohesion, responsibility rates of the team which is expected to have a negative impact on creativity since conscientious members are famous for achieving the targets and being responsible for the task in hand teams need moderate level of conscientiousness. Strong variance in conscientiousness is considered as beneficial. However, in team A average level of conscientiousness is low, so no matter how varied the team, the creative performance will be low.
B	<i>Moderate (+)</i>	<i>High (+)</i>	<i>High</i>	This team is expected to be the best performer in terms of creativity because there will be adequate levels of focus on the creative task and low level of rigid thinking and adherence to established ways of thinking and doing things. Having high level of diversity in conscientiousness within teams is also considered as good for the team to be able to reach the right harmony for the creativity. By way of saying, heterogeneity among members from all levels (high, medium and low) of conscientiousness is predicted to be the most creative composition.
C	<i>High (-)</i>	<i>High (+)</i>	<i>Low</i>	High level of conscientiousness is also not favoured within the teams because conscientiousness comes with the rigid thinking and tendency to act towards established ways of doing things and these types of features are not favoured when it comes to creativity. As mentioned above, high variability is seen as positive yet the average level of conscientiousness is high within the team thus there won't be strong influence on creativity.
D	<i>Low (-)</i>	<i>Low (-)</i>	<i>Low</i>	The mean level of conscientiousness is low and, as aforementioned, this situation is not seen as a promising one for the creative performance. In addition, when the average level of conscientiousness is low within the team, the level of variability is not expected to have strong influence on creativity.
E	<i>Moderate (+)</i>	<i>Low (-)</i>	<i>Low</i>	Although the mean level is moderate, Team H is highly homogeneous in conscientiousness that is not a favourable situation for creative performance because conscientious

				members often help in task motivation and idea selection in creativity. However without members who are good at idea generation it would be difficult to talk about creativity.
F	<i>High (-)</i>	<i>Low (-)</i>	<i>Low</i>	In this team, once again, the mean level is high and variability is low hence creativity performance is expected to be low.

3.5.4 Neuroticism:

Neurotic people are generally considered to be emotionally unstable, disagreeable and sometimes depressive, and thus they are likely to disrupt any cohesion among team members and cause conflict (Peeters *et al.*, 2006). Based on these strong negative-sided arguments, scholars predict negative relationships between creativity and neuroticism; despite this, some researchers have found no significant relationship between the two (Bolin and Neuman, 2006), whereas others have indeed found such a negative relationship, as expected (Hunter and Cushenbery, 2014; King, Wlaker and Broyles, 1996). In light of prior theory and related findings, the expectation is a positive linear relationship between low levels of neuroticism and creativity performance.

The hypothesis is:

H4a: The mean level of neuroticism has a negative relationship with student team creative performance, such that the highest performance will be at low mean levels of neuroticism.

The relationship between mean levels of neuroticism and team creativity is moderated by the variability in neuroticism, low levels of neuroticism are expected to generate the most positive impact on team creativity when there is a low level of variability within the team. In fact, research

and theory signify the benefits of emotional stability, which is the effective opposite of neuroticism, within teams. It is argued that the presence of neurotic members in work groups may have an unfavourable influence on performance through impeding cooperation, the climate and cohesion (Van Vianen and De Dreu, 2001). Pushing this argument further, other researchers have claimed that effective teams are those that are composed of emotionally stable members, rather than neurotic ones (Barrick *et al.*, 1994; Neumann *et al.*, 1999). Thus, this time, instead of heterogeneity, homogeneity in neuroticism with low mean levels is favoured for creativity, and thus the prediction is that low levels of variability in neuroticism should make the most promising positive change on the relationship between low mean levels of neuroticism and team creative performance. *Team D* (shown in red in the figure below) represents the ideal team, which is homogenous and has a low mean level score for neuroticism.

The second proposed hypothesis is:

H4b: The relationship between mean level of neuroticism and creative performance of student teams is moderated by variability in neuroticism, such that the association between low mean level of neuroticism and creative performance of student teams is most positive when the variability in neuroticism is low.

Figure 3.11: Variability in neuroticism is moderating the relationship between mean level neuroticism and team creative performance

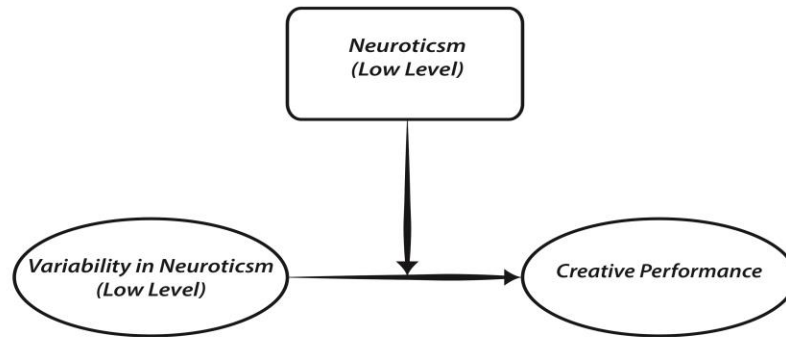


Figure 3.12: Team Types Based on Their Mean Levels and Variabilities in Neuroticism

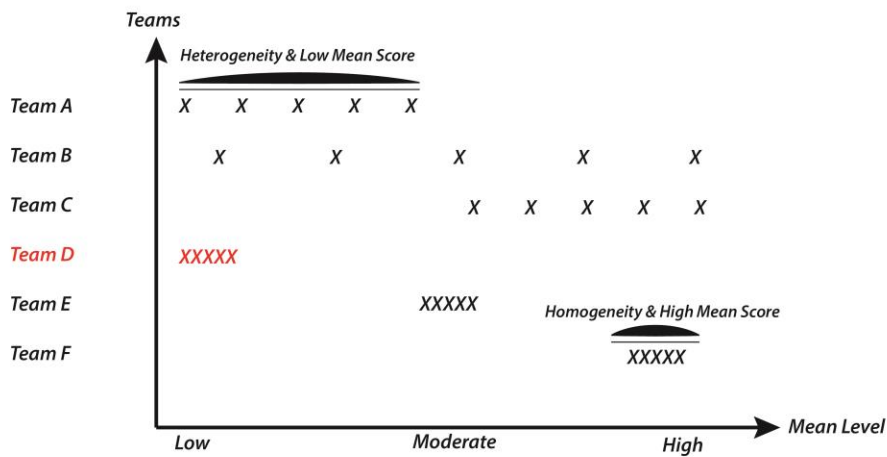


Table 3.4: Explanations of Performance Expectations of Team Types Based on the Mean and Variability Levels of Agreeableness

<u>TEAMS</u>	<u>LEVEL</u>	<u>VARIABILITY</u>	<u>CREATIVITY</u>	<u>REASON</u>
A	<i>Low (+)</i>	<i>High (-)</i>	<i>Low</i>	A low level of neuroticism within the team is considered beneficial for team cooperation, effective knowledge sharing and creativity. However, Team A loses the best performance due to having high level of variability. Considering the negative influences of the neurotic members on team climate, interpersonal facilitation and creativity, low variety in neuroticism is expected to create more promising results in terms of creativity.
B	<i>Moderate (-)</i>	<i>High (-)</i>	<i>Low</i>	As mentioned above, high variability in neuroticism is not favoured for creative performance of teams. Moving on to the moderate mean-level of neuroticism which refers to allowance of some level of neuroticism within teams. Considering the theory and research findings, even moderate mean level of neuroticism is not favoured for team creative performance.
C	<i>High (-)</i>	<i>High (-)</i>	<i>Low</i>	Based on the previous arguments, the interaction of high mean levels and high variety of neuroticism is predicted to generate negative results. Since groups like Team C are composed of members who high tendency of neurotic behaviours which may result in dysfunctional reactions to the situations and neurotic atmosphere within the teams.
D	<i>Low (+)</i>	<i>Low (+)</i>	<i>High</i>	Team G is expected to be the best performer team type in terms of creative performance. Because it has both low level of neuroticism and low level of homogeneity in neuroticism and each of these situations are most positively related with creativity.
E	<i>Moderate (-)</i>	<i>Low (+)</i>	<i>Low</i>	Although, Team H has low level of variability in neuroticism, it has average mean level of neuroticism all across the team which is likely to inhibit the creative potential of the teams.
F	<i>High (-)</i>	<i>Low (+)</i>	<i>Low</i>	In this team, once again, the mean level of neuroticism is high and the impact of low heterogeneity in the team is expected to be low hence creativity performance is expected to be low.

3.5.5. Openness to Experience

Adapting easily to new conditions, and searching for and finding alternative ways to solve problems, can be expected from team members who are open to experience (LePine, 2003). Thus, these members may assist their teams in the task-related conflicts that have been found to be crucial for group innovation. (De Dreu, 2006). Homan and her associates (2008) claimed that members who are open to new experiences also foster knowledge-sharing through becoming more receptive. Moreover, they can encourage group members to form a creative atmosphere to learn new things, and give support to new ideas that may again lead the team to greater originality (West, 2012). These arguments show that teams that have open individuals are more likely to be more creative and idea-generative because these individuals support knowledge sharing and encourage other members to share their ideas through being open. When it comes to research findings, whereas some researchers have found significant mean-level relationships between team creative performance and openness (Hunter and Cushenbery, 2014; Schilpzand, Herold, Shalley, 2011), whilst others could not find any association (Bolin and Neuman, 2006; Baer *et al.*, 2008; Robert and Cheung, 2010). Considering the strong theoretical support and mixed findings, in this research context mean level openness to experience is expected to have a positive linear influence on the idea development of students to devise new and attractive entrepreneurial projects. The expected hypothesis is:

H5a: The mean level of openness to experience has a positive relationship with student team creative performance, such that the highest performance will be at high mean levels of openness to experience.

The relationship between mean level of openness and team creative performance is moderated by variability in openness to experience; the theory states that teams aiming for creativity should have members who are open to new experiences and have a tendency to develop and support new idea generation (Betcholdt *et al.*, 2007). Research, on the other hand, has mixed findings regarding the relationship between openness to experience and creative performance; while some researchers have indicated strong associations between the variables (Baer *et al.*, 2008), others have found positive relationships between variability in openness and creative performance (Schilpzand, Herold and Shalley, 2010). Nevertheless, there is a strong relationship between openness to experience and divergent thinking (Litchfield *et al.*, in press). Hence, I argue that when the target is creativity, homogeneous teams with high mean-level openness are more creative because teams with low and moderate levels of openness to experience are not expected to produce the most positive outcomes, considering the prior literature and the predicted linear relationship between openness and creativity. Additionally, based on the strong association between openness to experience and both individual and group creativity, variability in openness is not favoured. As a result, the expectation is that homogeneity in openness to experience within teams that also have a high mean-level openness score is favoured. These types of team (as for *Team F*, shown in red in the figure below) are expected to reach the most positive creative outcomes in teamwork.

The second hypothesis is:

H5b: The relationship between mean level of openness to experience and creative performance of student teams is moderated by variability in openness to experience, such that the association between high mean level of openness to experience and creative performance of student teams is most positive when the variability in openness to experience is low.

Figure 3.13: Variability in openness to experience is moderating the relationship between mean level openness to experience and team creative performance

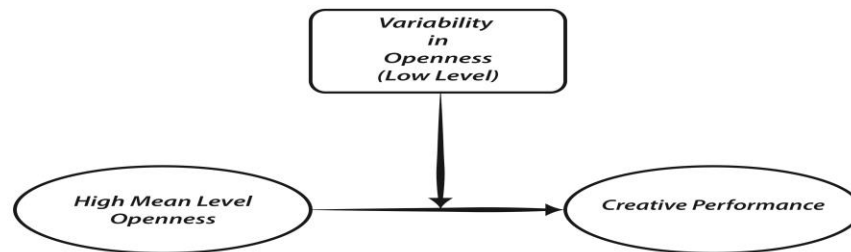


Figure 3.14: Team Types Based on Their Mean Levels and Variabilities in Openness

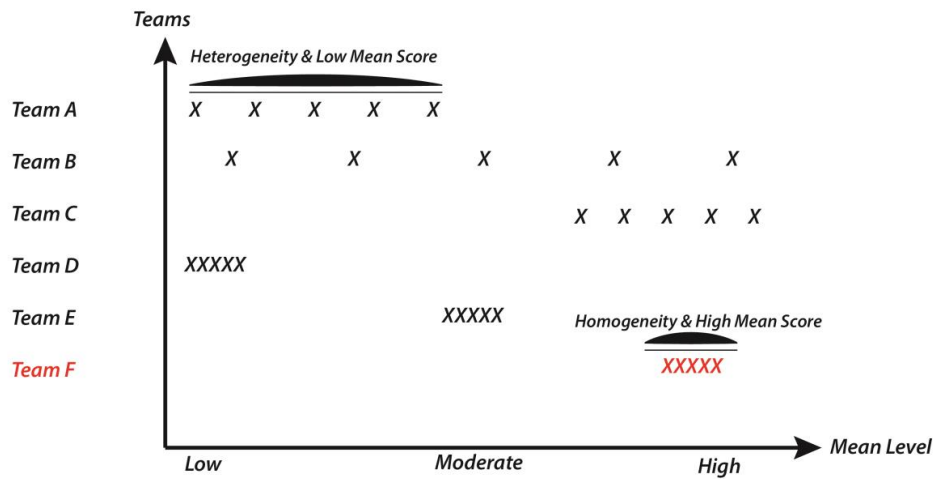
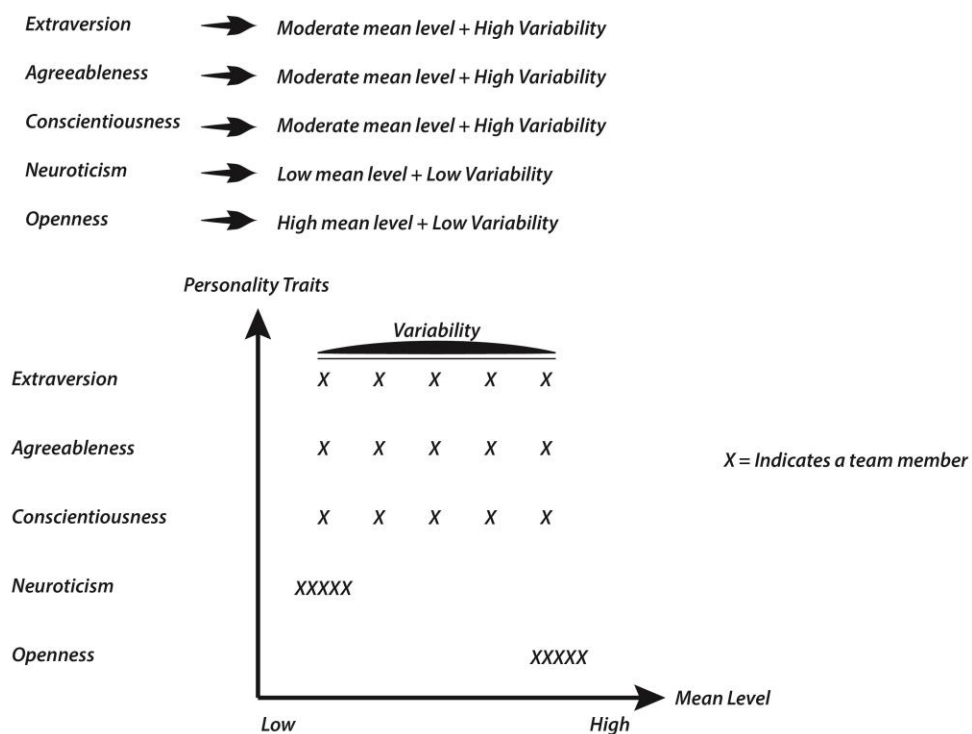


Table 3.5: Explanations of Performance Expectations of Team Types Based on the Mean and Variability Levels of Openness

<u>TEAMS</u>	<u>LEVEL</u>	<u>VARIABILITY</u>	<u>CREATIVITY</u>	<u>REASON</u>
A	<i>Low (-)</i>	<i>High (~)</i>	<i>Low</i>	Low level of openness to experience within the team reduces the acceptability of new ideas and idea sharing among members since there will be no open member who could facilitate the sharing and circulation of new ideas as well as supporting them. Strong variance among members is also not considered to be beneficial because the expectation is a linear relationship between openness and team creativity. The more open members are in the team the better their performance will be. Additionally, having high level of variety will not have a much impact on the relationship between mean level of extraversion and creativity as the average level of agreeableness is low across the team.
B-1	<i>Moderate (~)</i>	<i>High (~)</i>	<i>Moderate</i>	The prediction is the linear relationship between openness and creativity therefore moderate level of openness may also have positive impact on the team, but team B-1 is not the most preferred one when the target is creativity. High level of variability within the team in terms of openness to experience is considered as negative for the team. The prediction, in fact, favours the homogeneity in openness.
C	<i>High (+)</i>	<i>High (-)</i>	<i>High (But not best)</i>	Although Team C has high level of openness, the homogeneity level within the team is weak. Thus Team C is not likely to generate the most positive outcome.
D	<i>Low (-)</i>	<i>Low (+)</i>	<i>Low</i>	The mean level of openness is low and also variability is low which is not seen as a promising situation for the creative performance. Indeed, having been deprived of open members, team G may be the weakest link for the creativity.
E	<i>Moderate (~)</i>	<i>Low (+)</i>	<i>Low</i>	Although Team H is highly homogeneous in terms of openness to experience, its mean level is moderate. The moderate mean level of openness is not the preferred option for creative performance when there is a possibility for composing teams that have high mean level and homogeneity in openness as team I.
F	<i>High (+)</i>	<i>Low (+)</i>	<i>High</i>	Team I is predicted to be the best performer in terms of creativity. Because it consists of members all of whom are highly open to new experiences. Considering the expected linear relationship between creative performance and both

				homogeneity in openness and mean-level openness, this team is predicted to have the right composition in openness for creativity.

Figure 3.15: Summary Figure of Expected Personality Composition within Teams with Higher Creative Performance



3.6. METHODS

This study is quantitative in nature. The main purpose is to understand the relationship between the big five personality traits and creative performance of the student teams. In order to explain this relationship, I need to gather information from the student teams working on a creative task. As such, and given the aim of this research, the present study was designed as survey research and therefore a widely-used big five personality questionnaire was used to measure mean and variability personality levels of the students within their teams and quantitative methods will assist to test the developed hypotheses regarding their relationship with creative performance of teams.

3.6.1 Research Sample and Data Collection

The sample for this initial study include data from 137 individuals composed in 27 teams and ranging in age from 19-25 years. Within the scope of this research the teams were together for 5 weeks' time and their size ranged from 3 to 5 student members. The students were all assigned to their teams based on the diverse composition so that they were likely to differ based on their gender, ages or ethnicities etc.

This research conducted in the Enterprise and Entrepreneurship module 2014/15 under the control of the module leader. The module is designed for developing the skills and knowledge of the students about starting and running a business as well as examining the economical, political and societal assumptions regarding the nature of enterprise and entrepreneurship. Based on this information, the sample was taken from the student teams that are composed for the requirement of the module. Within the extent of this module the student teams need to develop creative and feasible business plans and present them with a brief overview of an

opportunity for a product, service or project. In fact, the information provided upon till now is in line with the definition of teams that is introduced in the introduction chapter. Therefore, the participant student groups involved in this study are considered as teams within the scope of this research. As a result, this module included the assessment of novelty and feasibility of the business ideas developed by student teams. In this regard, the context provided by the module was appropriate for investigating the relationship between personality composition and creative performance of teams.

It is noteworthy that, the tutorials supported student teams to prepare satisfying business plan and present their elevator pitch based on that plan. Module leader lead and delivered most of the tutorials and workshops covered in the module and more information will be provided about the process of this research process in the following parts.

In this study the data was collected through self-completion paper and pencil questionnaires. The questionnaires were delivered to student team members by the module leader and myself. Additionally, consent forms were collected in the second phase in week 2. There was no identification of teams in any outputs of the research and there wasn't any individual or team-level feedback for this study.

Data collection process consisted of 3 different phases which are explained in detail and summarised in table 3.7. First phase started in the first week of the 2014 semester 1, and it included delivery of the consent forms and information sheets for the whole research project - including mine and the lecturer's own research via the online learning environment of the University. In the information sheets, the aim and general conditions of the research, students`

privacy and participation rights and nature of the study were all explained clearly. Additionally, the voluntary nature of the study, anonymity and privacy rights of the participants were stated explicitly.

At the beginning of the first tutorial he had allocated the student teams and, after this allocation, the module leader gave each team a code and prepared a list of these teams. Then I liaised with him to gain the prepared lists of the teams for the research purposes. Later on, the student team members were invited to participate in this research. After that, but before delivering the questionnaires, I also coded each questionnaire in accordance with the codes given by the lecturer to each team. Therefore, all participants in one particular team received a questionnaire that had already been identified with the same code.

Second phase (held in Week 2) included delivery of the big five personality measurement questionnaires with survey covers. The personality questionnaires were distributed after all groups completed the module exercises and it took no more than 10 minutes. The students took these creativity workshops as part of the module relating to the topics of entrepreneurial behaviour and creativity, thus, this research did not have an impact on the learning environment.

In the third phase (Week 4) the creative performance of the student groups in a medium time period were assessed by the lecturer through joining the presentation sessions in which student groups transformed their ideas into feasible business projects (plans) in week 4 of the module. In these sessions the lecturer rated the novelty and feasibility of the ideas developed by student teams. There were 6 presentations that the lecturer couldn't attend because some sessions

were running at the same time. Thus, I provided summarising information regarding these presentations including the main focus of the project, which service or product is planned for market launch and how, and the relevant marketing and feasibility strategies developed by each of these 6 teams. Then the novelty and feasibility ratings were given by the lecturer based on the information I provided. Additionally, the researcher also liaised with the lecturer before and after the presentation sessions and considered his suggestions and experiences in terms of the assessment of the teams' creative performance.

Table 3.6: Study 1 Data Collection Process

Week 1: 2nd October 2014 (First Lecture of the Module)	Students were informed about the nature of research (including the aims, objectives, participation and privacy rights etc.) Consent forms and Information sheets were delivered via online learning environment by the module leader.
Week 2: 9th October 2014 (First Student Teams Tutorial)	Delivery of the Big five personality measurement at the end of the tutorial.
Week 5:	Presentations were made by the student teams within week five. I met with module leader to obtain rankings for presentations. He ranked 2/3 scores of the teams based on my explanations (the ones that I attended) and also ranked 1/3 (the ones he only attended and ranked).

3.6.2 Questionnaire Development

The questionnaires (big five personality traits) were used to measure personality levels of the student group members so that the conceptual model that is introduced in section 3 can be tested. The big five personality measurement scales are original, existing and previously used scales that were chosen after an extensive review of the prior literature. The 5 point Likert scale, which is ranged from strongly disagree to strongly agree, was used in most of the questions apart from the ones in demographic information scale.

The big five personality traits scales were originally designed in English and, because the research was conducted in an undergraduate management class in an English speaking country, there was no need for additional translation. Nevertheless, the scales were seen and checked by the module leader and its relevance with their appropriateness and relevance for the module was approved.

3.6.3 Measurement of Personality and Creative Performance of Student Teams

This chapter will present the measures that are used for determining members' personalities within student teams and creative performance of the student groups that participated in this research.

This study will focus on the association between personality composition and creative performance of students performing in an entrepreneurship and enterprise module in a

university located in Yorkshire, England. In this study, big five personality traits quantitative measures were used to measure personality levels in student teams respectively. Additionally, in order to measure team creativeness, an observational approach was used. The student groups and their business launch plans are ranked by the module leader, who is an experienced scholar in this area, based on their novelty and feasibility (Alper, Tjosvold and Law, 2000). Well-known and effective IPO model of team performance is taken as ground for this approach to understand and conceptualise the relationship between the measurements used for this study (Hackman and Morris, 1975; Guzzo and Shea, 1992).

Present research uses measures of variables included in the input-process-output model of team innovation. These measures were adopted with the aim of understanding relationships between personality composition and creative performance variables in student team settings. Each of these variables and their components are essential for the creative performance of teams and all of them are explained in Chapter Three (part two) and summarised in the Figure 3-1. In this part, measures of these components used for the initial study will be presented.

3.5.3.a) Measures of Input (Personality) Components:

As widely used and suggested big five personality measurement instrument, “big five factor inventory (BFI)” was used as an input variable for this study. BFI is a brief, comprehensive measure of five domains of personality (John and Srivastava, 1999). There is another known big five personality measurement named “NEO PI-R” which was developed by Costa and McCrae (1992). Although this measurement allows differentiated measurement of each big five dimension comprehensively, in comparison to BFI it is lengthy and some of the items may

cause difficulty in understanding for the participants. In fact, findings also show that short scales not only save time for both participants and researchers but also they reduce apathy (Bursich, 1984). In contrast to “NEO PI-R” measurement, “BFI” includes 8 to 10 items for each 5 constructs and uses one or two prototypical trait adjectives which make the items more understandable and elaborative (John & Benet-Martinez, 1998). For example; ‘considerate’ is an adjective used for agreeableness and the item supported and presented as “is considerate and kind to almost any one”. As a result, having other team processes and innovative performance scales in hand, as a comparatively short, well-known, understandable measurement that is already translated in to Turkish, BFI measurement is chosen. This study will use big five personality approaches as an organising framework for the examination of student team personality composition, and creative performance relationship (Mackinnon, Cox and Baraldi, 2011).

Agreeableness: This measure focuses on the reliability, cooperativeness and agreeableness levels of individuals operating within the teams. It also evaluates how open the students are to different ideas. The agreeableness scale consists of 9 items in total. Example of items included in this measure are “I see myself as someone who is helpful and unselfish with others” and “I see myself as someone who is generally trusting”.

Extraversion: As a second dimension of personality, extraversion assesses whether the team members are energetic, social and confident. This measure looks at the potential capacity of individuals to foster communication and knowledge flow within the team. Additionally, there are 8 items within the extraversion scale. “I see myself as someone who is talkative” are examples of the items that are used for the measurement of extrovert personality.

Conscientiousness: This measure evaluates whether members of the team are task-oriented and self-motivated. Many team level studies support the idea that groups that score high in conscientiousness are generally the high performance ones. Yet, when it comes to creative performance they do not stand out. There are 9 items within the conscientiousness scale and some of the items used to measure conscientiousness are “I see myself as someone who does a thorough job or perseveres until the task is finished”.

Openness to Experience: Indicates the openness of the individuals to creative and alternative way of doing things and solving problems. To this end, it measures the extent to which members` acceptance and adaptation level to new ideas and creative contributions. The scale of this personality trait consists of 10 items. The examples of the items used for this measure are: “I see myself as someone who is original and comes up with new ideas or who likes to reflect and play with ideas”.

Neuroticism: Teams sometimes contain anxious and emotionally defensive individuals. This measure is often likely to be a negative one and assesses the depressed and defensive personality levels. The scale of the of the neuroticism construct include 8 items and in the questionnaire, there were items as: “I see myself as a person who worries a lot or get nervous easily”.

3.6.4 Measure of Output (Performance) component:

Student Team Creative Performance: This measure helps to find an answer to the question of “How creative is the team?” Therefore, in the present study, an observation oriented ranking method was used by the module leader to rank novelty as a creative performance of the student projects. In addition to the novelty, feasibility scores were also ranked in order to explore implementation likeability of the ideas created. In this research, the 1 to 5 Likert scale was used to rank the novelty (creativity) and feasibility of the ideas where 1 was the lowest and 5 was the highest score in these rankings. The ranking was done by the module leader who is an expert in the field of entrepreneurship and creativity.

As can be understood, there are different ways of investigating, conceptualising and measuring team effectiveness and innovative performance. Although there is no model that ideally conceptualises the team innovation, the widely-used and highly-effective IPO model will be used for this research. Additionally, due to the aim of taking advantage of lecturers’ expert knowledge and experience, an observation method was chosen and used through rating novelty and feasibility of student projects. This observation-based checklist type of method is one of the earliest measurements in team-work-oriented research. One of the earliest applications of this method in the team performance field was done by Schifflett, Elsner, Price and Schemmer (1985). In the study, researchers measure team effectiveness through observing and rating resource allocation, orientation, time management, coordination and motivation of small military unit teams. Later on, Glickman and his associates developed a critical team behaviours checklist that consists of communication, cooperation and coordination, experience and prior training, and power relationships dimensions. Regarding team creative performance in this study, novelty measurement was used for the assessment of creative performance of the

teams. Additionally, the relationship between personality composition and feasibility of the ideas created by student teams was explored.

3.6.5 Control Variables

The sample size of this initial study is comparatively small and therefore it was critical to choose a number of related constructs as control variables. In this regard, the relevant demographical variables as *age*, *gender* and *nationality diversity* considered as control variables and their impact was examined in order to account for the possibility of any obscuring influences on the creative output. However, the results demonstrated that none the control variables have an influencing magnitude on the results of the present study. Hence, the control variables were not included in the data analysis process that examined the relationship among big five personality traits and creative outcome of the student teams. The separate regression results of each control variable with the creative outcome (including novelty and feasibility scores) of the student teams are included in the table below.

Table 3.7: The Results Related with the Influence of Control Variables on the Creative Outcome

	<u>NOVELTY</u>			<u>FEASIBILITY</u>		
CONTROL VARIABLES	(B)	(β)	p	(B)	(β)	p
Age	.159	.119	.555	.055	.066	.743
Gender	.343	.256	.198	.118	.141	.482
Nationality Diversity	.263	.193	.334	.266	.161	.110

3.6.6 Validity:

Exploratory factor analysis was used to measure validity of the measures used for study one. Exploratory factor analysis looks for the relationship between variables and assists in gaining understanding of how they relate to each other. This is particularly useful for scale development and discovering unknown factor structures (Brewerton and Millward, 2001).

3.5.6 a) Exploratory Factor Analysis (EFA):

Exploratory factor analysis was conducted to evaluate the consistency between expected factor structures and actual data. Therefore, EFA administrated on each scale that is used in inquiry, and principal axis factoring (PAF) analysis operated on all items in each scale with direct oblimin rotation in order to strengthen correlation between the factors. Additionally, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test were used to verify the sampling adequacy for each scale and to understand the sufficiency of item correlations for the analysis respectively. The number of the factors had been determined based on the scree plot and fundamentals of related theory (Dawson, in press). With regards to scree plot, researchers generally agree on determining the number of factors based on eigenvalues greater or close to 1 (Kaiser, 1960). Pattern matrices included in the EFA outputs were examined to evaluate the measuring power of used scales. Items whose loadings were below 0.4 are suppressed from the matrices (Hinkin, 1998). Finally, it should also be noted that each scale used in this study were well-established measures.

Exploratory Factor Analysis for Big Five Personality Traits:

In this section, five individual scales of the big five personality measurement scale will be explored through exploratory factor analysis. The Big five personality measure (BFI) used in this

research is an original measurement and it has previously been published in many psychology-related researches (John and Srivastava, 1999). However, it is still essential to determine the unidimensionality of each 5 personality trait subscales that compose the big five measurement (BFI). In order to determine the unidimensionality of each subscale I ran an exploratory factor analysis for each scale included in the BFI measurement. The exploratory factor analysis on 5 big five scales created scree plots for each measurement scale. All scales apart from agreeableness indicate a single strong factor. The scree plots and exploratory factor analysis tables for each scale used in this research can be found in the appendix section A.1. The dimensions of the used measurements accounted for some proportion of variance in their items. These percentages are presented in the table 3.7 below.

Table 3.8: Cumulative Proportions of the Factor Analysis Dimensions

<u>VARIABLES</u>	<u>CUMULATIVE % (ONE DIMENSION)</u>
Agreeableness	26.7 %
Extraversion	48.5%
Conscientiousness	37.8%
Neuroticism	35.7%
Openness to experience	32.6%

3.6.7 Reliability:

The results of reliability analysis show to what extent the used data is reproducible over time or occasions. Reliability analysis generates the Cronbach's alpha scores of the scales and this

score help us to assess the magnitude of the combined items to measure the same thing (Tavakol and Dennick, 2011; Downing 2004). In this study, the reliability analysis was done for all measurement scales including in the questionnaires and rankings. As indicated in the table 3.10 below all of the reliability scores of the used measures are above .70 instead of agreeableness scale. Therefore, the measures are fairly reliable (Nunnally and Bernstein ,1994).

Table 3.9: Reliability Analysis

<u>Measured Components</u>	<u>Variables</u>	<u>Cronbach`s Alpha</u>	<u>Number of Items</u>
<i>Inputs (Personality):</i>			
	Extraversion	.847	8
	Conscientiousness	.786	9
	Agreeableness	.647	9
	Openness	.723	10
	Neuroticism	.732	8

3.6.8 Correlation among variables

The results given in Table 3.12 below represent the bivariate correlations among variables. For this type of correlation, the Pearson's correlation coefficient and two tailed significance tests were used. According to the correlations matrix, which is created based on the team level data and presented below, agreeableness is positively correlated with conscientiousness and negatively correlated with neuroticism. Neuroticism is negatively correlated with agreeableness and extraversion. Openness to experience is positively correlated with conscientiousness. Moving on to the variability in teams, the same bivariate correlations and methods were used to investigate the correlations between dependent and independent data. It is noteworthy that In

the correlation table, while variables ending with “_m” represents mean level values, others ending with “_sd” indicates standard deviation scores.

Table 3.10: Means and Standard Deviation Values of the Variables

Variables	Mean Value	Standard Deviation
Agreeableness (Mean Value)	3.7835	.29562
Extraversion (Mean Value)	3.4998	.35856
Conscientiousness (Mean Value)	3.6211	.28724
Neuroticism (Mean Value)	2.6654	.37396
Openness (Mean Value)	3.5351	.23801
Agreeableness (Standard Deviation)	.4044	.17680
Extraversion (Standard Deviation)	.6102	.23737
Conscientiousness (Standard Deviation)	.5310	.22404
Neuroticism (Standard Deviation)	.5165	.20012
Openness (Standard Deviation)	.4511	.22953
Novelty Score	2.4815	1.34079
Feasibility Score	2.1852	.83376

Table 3.11: Correlation Table

	Agre_m	Extrv_m	Cons_m	Neur_m	Open_m	Agree_sd	Extra_sd	Cons_sd	Neuro_sd	Open_sd	Novelty	Feasibility
Agre_m	1											
Extrv_m	.186	1										
Cons_m	.525**	.103	1									
Neur_m	-.335	-.683**	-.224	1								
Open_m	.274	.335	.418*	-.215	1							
Agre_sd	.071	.368	-.229	-.234	.090	1						
Extr_sd	-.099	.110	.030	.004	-.061	.086	1					
Cons_sd	-.214	.196	.062	-.298	.126	-.079	.299	1				
Neur_sd	-.048	.051	-.071	-.034	.128	.458*	.165	.153	1			
Open_sd	-.174	-.189	-.098	.296	.279	.166	.037	-.336	.034	1		
Novelty	-.150	-.038	-.052	.017	.225	.200	.095	.026	-.115	.282	1	
Feasibility	.047	0.58	-.052	-.200	.133	-.068	-.192	.329	.030	.061	-.186	1

3.7. RESULTS

This section is designed for the demonstration of the statistical data that indicates the relationships between personality composition and novelty as a creative performance variable of student teams. In addition, the statistical indication of the association between personality and feasibility of the ideas presented by student teams is also exhibited here. The results section of the thesis involves both the presentation of the statistical methods used to analyse the data collected, and the results related to test of hypotheses. Multiple regression analysis was applied to test the hypotheses and SPSS software version 21 was used to do all analyses.

There are 2 main analyses in study 1 that are linear and moderated regression analyses. In the first part of the results section, hypotheses (including direct ones indicated in figure 3.16) related to mean level of inputs will be tested and results of these tests will be displayed. Hypotheses predicting direct relationships were tested via linear regression analysis. Moving on to the second part, the focus will be on test results of the hypotheses (indicated in figure 3.16) with regards to moderating relationships. These moderating relationships were tested through moderated regression analysis.

This study also involves control variables, which are *age*, *gender* and *ethnicity* of the student team members. I have controlled these variables in order to account for possible obscuring effects. For instance, teams composed of relatively higher-aged students might be associated with increased creativity and this finding may have a confounding influence on the results that are supposed to be related with impact of personality on team creativity.

3.7.1 Hypotheses Testing

The aim of this section is to test the hypotheses that are proposed in section 3.2. The hypotheses will be used to examine the relationship between input, process and output variables, in order to understand the dynamics among personality composition and creative performance.

3.7.1.a) The Linear Relationships Between Mean Level Inputs, Outputs

The hypotheses related to mean levels explain the relationships between input elements (big five personality traits) and output (creative performance) factors that are defined as originality of ideas. These hypotheses range from H1A to H5A and multiple regression analysis was used in analysis. Specifically, linear regression analysis was used for the hypotheses representing linear (H4a, H5a) and curvilinear relationships (H1a, H2a, H3a). The big five personality traits variables and their interaction with team creative performance were tested through related syntax commands by using SPSS 21 software. The results of the hypotheses testing will be shown in the table below and values for each dimension represents a separate regression scores.

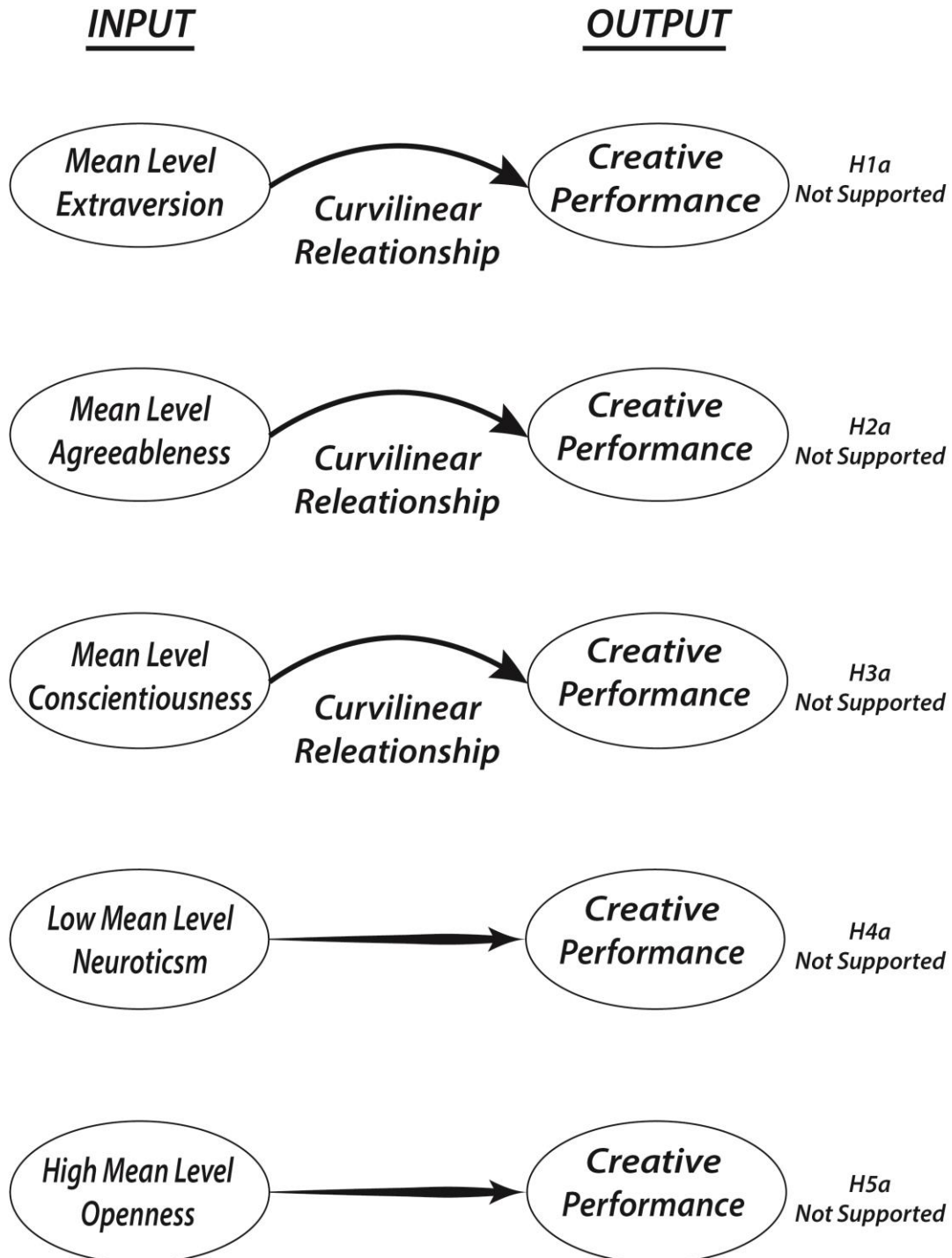
Table 3.12: The results of the team level Input - Output Related Hypotheses

PREDICTOR VARIABLES	<u>NOVELTY</u>			<u>FEASIBILITY</u>		
	(B)	(β)	p	(B)	(β)	p
<u>Team Inputs</u>						
Extraversion	-.142	.112	.589	-.054	-.068	.742
Agreeableness	-.155	-.272	.255	.012	.033	.891
Conscientiousness	-.169	-.134	.514	-.185	-.237	.244
Neuroticism	.022	.017	.934	-.167	-.200	.316
Openness	.302	.225	.258	.111	.133	.508

***p≤0.001, **p≤0.01, *p≤0.05

The results in Table 3.13 indicate that there is no direct relationship between big five personality traits and student team creative outcome (including novelty and feasibility aspects). As can be inferred from the results there is no statistically significant curvilinear relationship between mean levels of extraversion, agreeableness, conscientiousness and creative performance of student teams. Therefore the results revealed that hypotheses H1a, H2a and H3a are not supported. Another finding that inclined with hypothesis H4A signals no significant interaction between mean level neuroticism and team creativity. The final hypotheses H5A regarding association between openness and creative performance also not supported by the results.

Figure 3.16: Results of the hypotheses related to mean level relationships



3.7.1.b) Moderated Relationships between Input, Moderator and Output Variables

The figure 3.16 below embodies the hypotheses that imply moderated association between inputs and outputs. The hypotheses range from H1B to H5B and moderated regression analysis was used to test the moderated hypotheses (H1b, H2b, H3b, H4b, H5b). Once again the interaction between variables were tested through using related syntax commands by using SPSS 21 software. The results of the hypotheses testing will be shown in the tables below. The first three tables represent the interaction between moderator (eg. variability in extraversion) and curvilinear relationship (the curvilinear association between mean level extraversion and creative output). Therefore they include additional squared interactions and the fifth lever of each 3 table is particularly represents the predicted relationship.

Table 3.13: The Results of the Moderated Relationship Between Variability in Extraversion and Creative Performance

	PERFORMANCE MEASURES					
	<u>NOVELTY</u>			<u>FEASIBILITY</u>		
	(B)	(β)	p	(B)	(β)	p
Variability in Extraversion	-.076	-.056	.814	.097	.117	.622
Mean Level of Extraversion	.090	.067	.827	-.085	-.102	.738
Mean Level of Extraversion Squared	.128	.100	.686	-.086	-.109	.657
Mean level of Extraversion x Variability in Extraversion	.184	.116	.656	-.069	-.071	.784
Mean Level Extraversion Squared x Variability in Extraversion	.088	.077	.840	-.129	-.180	.632

***p $\leq$ 0.001, **p $\leq$ 0.01, *p $\leq$ 0.05

The results in Table 3.14 indicate that the hypothesis H1b, that signifies the positive impact of high variability in extraversion on the relationship between moderate mean levels of extraversion and creative performance, is not supported. As can be seen in the table, none of the associations are significant. This result is indicated particularly by the fifth lever of the Table 3.14 that shows the interaction between moderator (variability in extraversion) and squared independent variable (mean level of extraversion).

Table 3.14: The Results of the Moderated Relationship Between Variability in Agreeableness and Creative Performance

	PERFORMANCE MEASURES					
	<u>NOVELTY</u>			<u>FEASIBILITY</u>		
	(B)	(β)	p	(B)	(β)	p
Variability in Agreeableness	.021	.015	.963	-.105	-.126	.728
Mean Level of Agreeableness	.220	.164	.439	-.147	-.177	.443
Mean Level of Agreeableness Squared	-.309	-.542	.068	.004	.013	.968
Mean Level of Agreeableness x Variability in Agreeableness	1.387.	.581	.110	.081.	.055	.886
Mean Level of Agreeableness Squared x Variability in Agreeableness	-.719	-.552	.180	.264	.326	.458

***p $\leq$ 0.001, **p $\leq$ 0.01, *p $\leq$ 0.05

Based on the results above, it can be inferred that the hypothesis H2b, which underlines the positive impact of high variability in agreeableness on the relationship between moderate mean level of agreeableness and creative performance of teams (including novelty and feasibility aspects) does not found support. Once again the table does not show any significant relationships among variables.

Table 3.15: The Results of the Moderated Relationship Between Variability in Conscientiousness and Creative Performance

	PERFORMANCE MEASURES					
	<u>NOVELTY</u>			<u>FEASIBILITY</u>		
	(B)	(β)	p	(B)	(β)	p
Variability in Conscientiousness	.050	.037	.885	-.086	-.103	.679
Mean Level of Conscientiousness	.071	.053	.848	.282	.338	.213
Mean Level of Conscientiousness Squared	-.110	-.088	.759	-.150	-.192	.489
Mean Level of Conscientiousness x Variability in Conscientiousness	.411	.257	.375	-.021	-.022	.938
Mean Level of Conscientiousness Squared x Variability in Conscientiousness	-.036	-.030	.933	-.077	-.106	.762

***p≤0.001, **p≤0.01, *p≤0.05

Table 3.16 shows that hypothesis 3b test results do not reveal any significant positive moderating impact of high variability in conscientiousness on the relationship between moderate mean level of conscientiousness and creative performance of student teams including novelty and feasibility scores.

The tables 3.17 and 3.18 below show the moderated linear relationships. In this regard the results within the third level of the table are particularly helpful for understanding the nature of the moderated relationships since it includes the values representing the impact of moderator (eg. variability in neuroticism) on the relationship between independent (eg. mean level of neuroticism) and dependent variables.

Table 3.16: The Results of the Moderated Relationship Between Variability in Neuroticism and Creative Performance

	PERFORMANCE MEASURES					
	<u>NOVELTY</u>			<u>FEASIBILITY</u>		
	(B)	(β)	p	(B)	(β)	p
Variability in Neuroticism	-.100	-.075	.753	-.015	-.018	.938
Mean Level Neuroticism	.077	.057	.814	-.205	-.246	.310
Mean Level of Neuroticism x Variability in Neuroticism	-.156	.095	.722	-.101	-.099	.706

***p $\leq$ 0.001, **p $\leq$ 0.01, *p $\leq$ 0.05

The table 3.16 above represents the results of the hypothesis H4b. In particular, the values in the third level represent the predicted positive impact of low variability in neuroticism on the relationship between mean level of neuroticism and creativity related outcomes. However, as can be seen from the table none of the relationships presented in the table are significant.

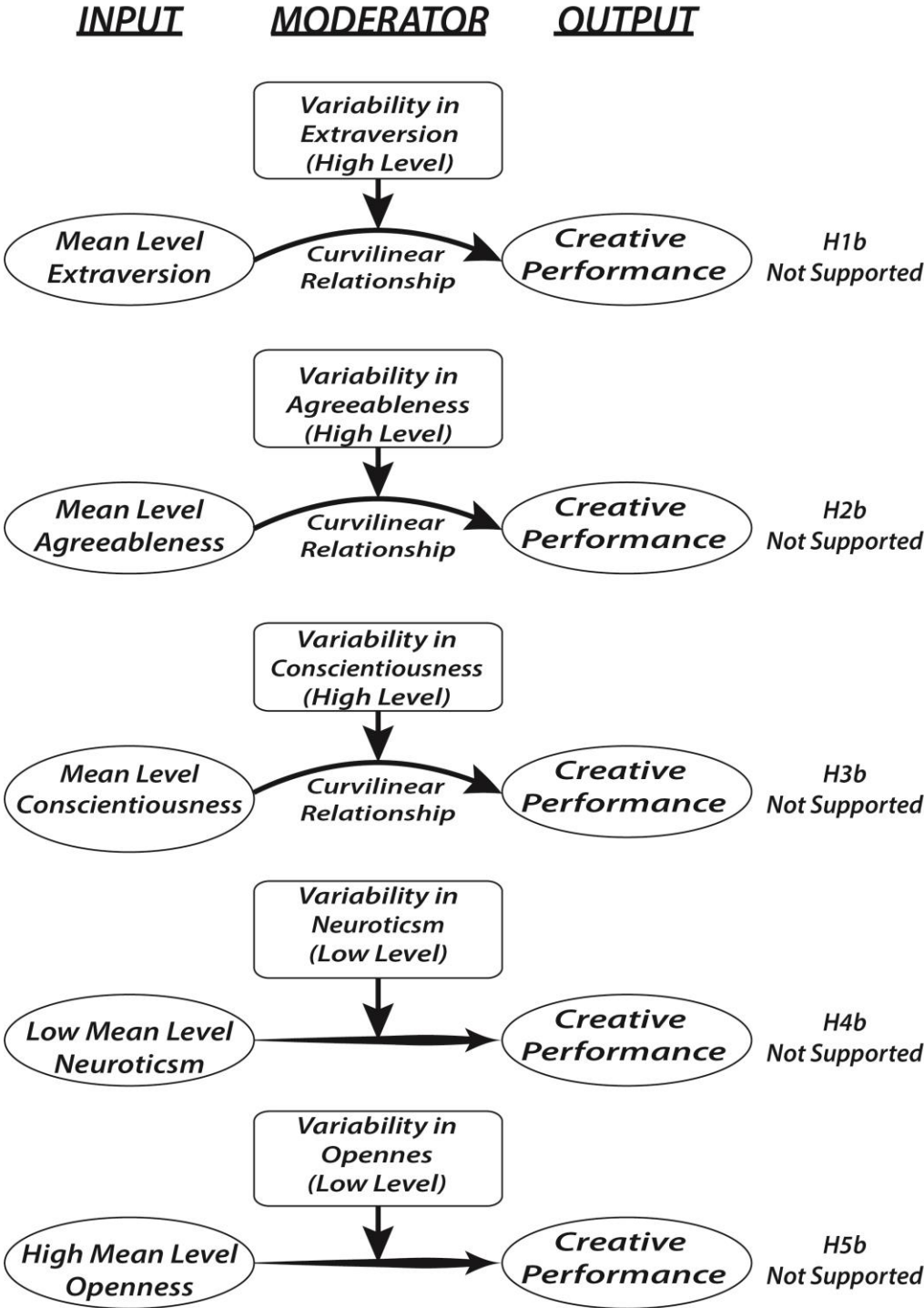
Table 3.17: The Results of the Moderated Relationship Between Variability in Openness to Experience and Creative Performance

	PERFORMANCE MEASURES					
	<u>NOVELTY</u>			<u>FEASIBILITY</u>		
	(B)	(β)	p	(B)	(β)	p
Variability in Openness to experience	.404	.301	.179	.051	.062	.791
Mean Level Openness	.229	.171	.410	.110	.132	.544
Mean Level Openness x Variability in Openness to experience	-.173	-.172	.427	-.061	-.097	.669

***p $\leq$ 0.001, **p $\leq$ 0.01, *p $\leq$ 0.05

The final moderating hypothesis is H5b and the table shows the results related to this hypothesis. According to these results above there is no significant positive impact of low variability in openness on the relationship between high mean levels of openness and novelty and feasibility of ideas created from student teams. Once again the figure below summarizes the hypotheses and the results of the hypotheses tests.

Figure 3.17: Results of the Moderating Hypotheses



3.8. DISCUSSION

In this chapter, the relationship between personality composition and creative performance of the student teams was examined through study 1, and the results related to this relationship have been presented. In this section, the main findings of the first study will be discussed and illustrated. Additionally, based on the findings of study 1, potential implications will also be discussed and practical recommendations will be provided to researchers interested in team work, particularly in contexts where student teams are involved. Further, there will also be suggestions for practitioners, module leaders and lecturers with regards to the role of personality traits on student team composition, and its influence on the creative performance of student teams. Finally, this section will discuss the limitations of this study and will indicate potential future research areas.

Based on the results presented in the previous section, there is no significant correlation between the input and output variables that are presented within the hypothetical framework. Therefore, all the relationships presented within the model were unsupported and, consequently, the hypotheses proposed in study 1 did not find any support. There may be several reasons for the weakness of relationships predicted through hypotheses.

One reason is the reliability scores of the big five variables used in the present research. Although most of the scores were above .70, only extraversion has a score is above .80 and a significant reliability score. In addition, the reliability of the agreeableness variable is below the minimum expected reliability score of .70; Therefore, the reliability values of the measures used for each personality trait may not have the power to explain the relationship between input and output variables.

When it comes to the skew of the data, the distribution of all the variables (apart from agreeableness) used in the present research are approximately symmetric, whilst the distribution of the agreeability variable is negatively skewed. This means that the variables with roughly symmetric distributions are eligible to give adequate distributions within the sample used for study 1.

The first prediction in this study was that of the positive relationship between a moderate level of extraversion and the creative performance of student teams. However, the findings show that there is no relationship between moderate mean-level extraversion and student teams' creative performances. As stated in the hypotheses development section, there is strong theoretical and research support for the stimulating role of extraverts on team communication and knowledge-sharing that is particularly essential for creative outputs (Costa and McCrae, 1992; Barry and Stewart, 1997; Barrick *et al.*, 1998; Van Vianen and De Dreu, 2001). However, previous research findings contradict the theoretical arguments, finding no relationship between extraversion and team creativity in different contexts (Bolin and Neuman, 2006; Robert and Cheung, 2010); the findings of this research are in line with the findings of previous investigations as regards the association between mean-level extraversion and team creativity. One possible explanation for this finding is that extrovert individuals may not have adequate levels of creative confidence to have an impact on team-level creativity, since in their study, Baer and co-workers (2008) found that creative confidence is the prerequisite for mean-level extraversion to result in high-level team creativity. Alternatively, the absence of a strong incentive in extrovert members can also be a reason for ineffectual results in terms of creative performance. In fact, Bouchard (1972) found that teams with high mean extraversion perform well when the members are highly motivated, and performed less well with members who are less incentivised.

The second hypothesis was related with agreeableness and its influence on student teams' creative performance, predicting a curvilinear relationship between agreeableness and creative performance of the teams since both theory and research findings favour a certain level of task conflict and disagreeableness in order to foster creative abrasion and idea generation among team members (De Dreu, 2006; Jehn, 1995). However, the findings of the present research indicate no significant association between agreeableness and creativity. One potential cause of this finding is that team members with these personality traits did not engage in constructive discussion or provide candid critical feedback about the ideas generated by other members, which is seen as pivotal to the development of novel ideas and generation of feasible solutions. In fact, these findings support previous findings with regards to the relationship between mean-level agreeableness and team creative performance (Driskell *et al.*, 1987). In addition, based on these findings, other scholars have argued that agreeableness may have a weak predictive value on creativity-related tasks and some even did not investigate its relationship with the creative performance of the teams (Bolin and Neuman, 2006).

Contrary to expectations, the present inquiry did not find any considerable correlation between mean-level conscientiousness and the creative performance of student teams. However, previous investigations found mostly positive relationships with team performance (Barrick *et al.*, 1998; Neumann *et al.*, 1999) or, conversely, negative relationships with team creative performance (Baer *et al.*, 2008; Robert and Cheung, 2010). The discrepancy between current findings and previous research results can be attributed to the lack of predictive influence of the conscientious members on the generation of both novel and feasible ideas, which was also stated within the model developed in the study conducted by Driskell, Hogan and Salas (1987).

The lack of significant relationships between mean neuroticism and group outcomes contradicts the theoretical predictions, however, entirely in line with previous findings (Baer *et al.*, 2008; Bolin and Neumann, 2006). In personality literature, it is believed that because of the depressive and unstable nature of neurotic members, these individuals are likely to have a negative association with team effectiveness by disrupting the climate, cooperation and cohesion within the team (Barrick *et al.*, 1998; Neumann *et al.*, 1999; Van Vianen and De Dreu, 2001). On the other hand, research projects that probed the relationship between personality and team creativity do not indicate any significant relationships between neuroticism and team creative performance. For instance, a study conducted by Baer and co-workers did not find any correlation between neuroticism and team creativity. In addition, Bolin and Neuman (2006) investigated the relationship between emotional stability (the opposite variable to neuroticism) and creative performance and, once again, could not find any considerable association between these variables. Therefore, the present study has the characteristic of being the third study that both supports previous findings and contradicts theoretical predictions. Considering these mutually-supporting research studies in terms of team creativity, it can be argued that, in contrast to theoretical considerations, the expected negative effect of neurotic members and low emotional stability within teams may not be sufficient to influence the creative performance of the teams.

The final direct relationship hypothesis considers the relationship between openness to experience and team creative performance. In fact, this particular, independent variable of the big five framework is the one which is mostly associated with creativity by scholars, both at individual and team levels. Therefore, it is somewhat surprising that the findings of this research do not support the idea of a positive relationship between openness to experience and team creative performance. When it comes to previous research findings of this nature, results have been, in fact, mixed. Although some researchers found positive relationships, in

line with theoretical predictions (Hunter and Cushenbery, 2014; Schilpzand, Herold, Shalley, 2011), other studies did not find any significant association between mean openness and creativity (Bolin and Neuman, 2006; Baer *et al.*, 2008; Robert and Cheung, 2010). The present study 1 is another study that indicates a lack of any relationship between the variables. One possible explanation for the distinction among the findings of different investigations could be the minor differences in the methodologies and scales used.

In this study, the impact of variability levels of personality traits on the relationship between mean-level personality composition and creative performance is also investigated for each of the five predicted relationships. The personality and team performance literature involves studies investigating the interplay between variability in personality traits and team performance. However, to the best of my knowledge, there is nothing in the literature that investigates moderating power variability on the relationship between mean-level personality composition and team creative performance. Starting from here, the aim of the present inquiry is not only to investigate the relationship between mean-level personality composition and team creative performance, but also to probe the moderating power of variability in personality composition on the relationship in order to gain further understanding as to the association between personality composition and team creative performance. However, the results indicated that the variability of personality traits does not have a moderating power on the relationships between independent (personality traits) and dependent (creative performance of student teams) variables.

The first hypothesis on the positive relationship between moderate mean level of extraversion and creative performance predicts that this relationship is most positive when the variability in extraversion is high. However, the results show that a high level of variability in extraversion as a moderating factor does not have a significant effect on the association

between moderate mean-level extraversion and creative performance of student teams. This finding demonstrates that neither mean level of extraversion nor variability-level extraversion play an essential role in generating novel and feasible ideas.

Moving on to the moderating hypothesis test results on agreeableness, once again, the present study did not generate any significant findings on the relationship between mean level agreeableness and team creative performance through the moderating role of high levels of variability in agreeableness. This finding indicates that the diversity of agreeable members within the team does not have a significant influence on the relationship between mean levels of agreeableness and creative performance of student teams.

In this study, it has been found that high variability in conscientiousness did not have an impact on the association between moderate mean-level conscientiousness and creative performance. Based on these findings, it can once again be inferred that variability in conscientious members of student teams does not influence the expected curvilinear relationship between mean-level conscientiousness and team creative performance. One possible reason for this finding is that conscientious individuals may not play a vital role in novel idea generation, and focus more on well-defined tasks. Therefore, their diversity structure within the teams does not have any particular impact on the relationship.

Turning to the findings on the impact of neuroticism with low variability on the association between mean-level neuroticism and creative performance, the findings show that the expected negative impact of high neuroticism on creative performance is not influenced by a low variability level of neuroticism. This finding indicates that along with mean-level neuroticism, a variability-level neuroticism does not have much influence. One potential explanation for the absence of a moderating relationship could be the relatively short-lived

nature of the present study. Though student teams operated together to generate novel and feasible projects, the short time period the members actually spent together may have inhibited the mean and variability-level stimuli on neuroticism on the creativeness of teams.

Final hypotheses are about the relationship between the high mean-level openness to experience and creative performance that is moderated by variability level openness to experience. Once again, the findings of the present research do not indicate a strong moderating relationship. Openness to experience is seen as the variable that is most closely related with creativity in the big five personality framework (Betcholdt *et al.*, 2007). Accordingly, the theoretical indication is towards homogeneousness of these individuals within the team context (Baer *et al.*, 2008). However, in a study conducted in 2010, Schilpzand and co-workers found that, in fact, diversity in openness to experience is important for creativity. Although this finding is an unexpected one, the researchers argued that, along with the open members, there needs to be some members who are low in openness to experience to assist the team in evaluating ideas and to choose the best possible idea to pursue (Litchfield *et al.*, in press; Schilpzand *et al.*, 2010). They push this argument further and state that this may be because the members high in openness are highly focussed on developing ideas and dominating the associated discussion, which may hinder the others members' contributions and distract them from creativity (Schilpzand *et al.*, 2010). However, the big five framework suggests that members who are open to new experiences are the ones who are most open to others' contributions and most willing to support alternative approaches, instead of dominating discussions (Peeters *et al.*, 2006; LePine *et al.*, 2011). What is more, the findings of the present study do not give much credit to the variability of openness to experience regarding its influence on the proposed relationship. Additionally, and contrary to the arguments above, Baer and co-workers found that members with low mean-level openness are associated with either a neutral or negative

influence on creativity as contingent upon their creative confidence. As a result, it is clear that there are mixed findings and different arguments with regards to the influence of variability on creativity. Therefore, any further research needs to evaluate the heterogeneity and homogeneity of openness to experience and its impact on creative performance of teams further.

The findings of this initial study indicate that when it comes to creative performance, at least in the context of student teams, the personality of the individuals does not play a vital role on team-level idea generation and feasibility. To this end, the results of this research demonstrate that team-level creativity may be more complicated than individual levels. Furthermore, the influence of mean and variability-level personality configuration may be weaker than the individual-level impact. The findings of the present study contradict the theoretical basis and predictions of the aforementioned studies that focused on the personality and creativity relationship on team levels (Driskell *et al.*, 1987, Bolin and Neumann, 2006; Baer *et al.*, 2008; Robert and Cheung, 2010; Schilpzand *et al.*, 2010). The results signify weak associations between personality and team creativity in team levels. Therefore, the decision-makers, particularly the ones responsible for the formation of such short-lived teams as student teams, need to be careful when considering the personality composition of the teams that aim for creative results.

Given these findings for study 1, this research project goes further and investigates the personality composition and team-effectiveness relationships in a real business R&D context, where the target of developing novel ideas and implementing those ideas for innovation and competitiveness is crucial. I believe that the following research, that is conducted in a highly creative and innovation-oriented, knowledge-intensive context, will

contribute to the existing findings and discussion on the complex role of personality composition on team-level innovation.

3.9. LIMITATIONS

This first study aimed to examine the direct interaction between the big five personality traits and the creative performance of student teams through the use of the input-output model. Therefore, it has used some big five personality and creative performance measures that rely upon single performance ratings. In addition, the novelty of the ideas generated by the students was the only measure I was able to use to assess creativity, owing to the context and requirements of the existing module. These are limitations related to the measurements that, when used in this study and in future research, can address the restrictions alongside any measurements.

The number of participating teams (in other words, the sample size) could be more than 27. Additionally, this study is conducted in an artificial setting, which naturally raises questions as to whether the results of this research can be generalised to teams operating in work organisations. These reasons constitute the other limitations of this study. Although there are studies that examine the same relationship using sample sizes and settings similar to the present study (Schilpzand *et al.*, 2011), the number of teams participating were relatively limited and some possibly significant relationships may have remained undetected during the data analysis. Therefore, future investigations that cover work-related settings with bigger sample sizes may produce more reliable and generalised results. Having said that, the reliability score of the agreeableness, which is represented by the Cronbach alpha value, is below .70, which signifies a weak predictive magnitude for the relationships between

agreeableness and other variables. Future research may use alternative original scales to measure either the influence of all big five variables or only the agreeability variable.

Furthermore, the duration of the current investigation was relatively short, since students only worked as a team for five weeks. In addition, considering the other modules that the students took at the same time, the meeting periods of the student teams might not be considered particularly intensive. To this end, when compared to most work groups that engage in creative tasks within organisations, the team tenure and cooperation level of student teams is significantly less than for real work teams. Indeed, with prolonged time spans and cooperation, the influence of personality may have found to be significant.

3.10. CHAPTER SUMMARY

This chapter contains the initial study (Study 1) of this thesis, in which the relationship between personality and creative performance of student teams was examined. The personalities of the team members were determined through using the well-known big five personality traits framework. Accordingly, the association between personality traits and student teams' creative performances has been conceptualised using an Input-Output model whose own basis is the well-known IPO framework, which is used for conceptualisation of variables related to team performance. Surprisingly, none of the hypotheses were supported by the results of the analysis section. In this regard, as opposed to the findings associated with general team performance within the literature, these findings indicate that personality has a surprisingly passive role when teams perform such complex tasks as novel idea generation.

This study will now be followed by an extended second study that probes the relationship between personality and team innovative performance with more variables in a real-world, knowledge-oriented R&D work context. Additionally, the coming study will use an original measure with multiple items to rank innovative performance; it will involve far more work teams, most of which have been operating for longer periods, and often with far more intense interactions in comparison to the present study. Therefore, the following study will address most of the limitations of the first study whilst bringing new dimensions to the discussions related to personality composition and team performance.

CHAPTER.4: STUDY 2 – KNOWLEDGE WORKER TEAM PERSONALITY COMPOSITION AND INNOVATIVE PERFORMANCE

4.1 INTRODUCTION

In Study 1 the focus was on the impact of personality composition on creative performance of student teams. It looked at the linear and nonlinear relationships between the big five personality traits and team creative performance. This second inquiry is an extended version of Study 1, and there are six ways in which this second study builds on the first.

- 1) The second study focuses on personality composition and teams working in real public and private sector organisations.
- 2) This second inquiry investigates the personality composition and team performance relationship on a larger scale and in a knowledge-intensive context that is distinct from the previous study. The workers performing in knowledge-intensive organisations are named knowledge workers, and the teams they compose are known as knowledge worker teams. The main focus of these individuals and teams is to innovate. In other words, their aim is not only being creative but also to implement their findings at the same time (Thamhain, 2003). Thus, unlike study 1, the impact of personality composition will be examined on knowledge worker teams' innovative performance including creativity and implementation aspects in a knowledge-intensive context.
- 3) In the present study, in addition to the “big five” personality traits, the “dark triad” personality traits will also be used as input factors, which fits into the IPO model. The

dark triad personality traits consist of three (Machiavellianism, narcissism and psychopathy) personality traits (Paulhus and Williams, 2002). The reason for the addition of the dark triad is due to recent arguments regarding the incomprehensible nature of the well-studied big five approach to personality. The claims indicate that although the big five traits is one of the most used approaches, and has a promising nature in embracing individual personalities, additional traits also need to be considered; the nature of these additional dimensions should be in line with socially malevolent behaviour to be effective on inclusion (Veselka, Schermer, Vernon, 2012; Almagor; Paunonen and Jackson, 2000).

- 4) This study uses the input-process-output (IPO) model of team innovation, which was devised by Hackman and Morris (1975), and successfully adapted for team innovative performance by West and Anderson (1996). Later, the number of team processes were extended in the paper written by Hulsheger, Anderson and Salgado (2009). In the present study, the personality traits are the inputs, the innovation-related team processes are the process variables, and innovative performance is the output variable.
- 5) Furthermore, team process variables (team participation, task focus, shared objectives, support for innovation, team communication, team cohesion, relationship and task conflict) will be included in the processes part of the model. This is because the focus of study 2 is on innovative performance of the knowledge worker teams, and these processes are implicated as the main predictors of team level innovation (Hulsheger, Anderson and Salgado, 2009).

In terms of structure, this chapter is composed of five sections. In section 4.1, the particular knowledge work environment is addressed to introduce both the context in which study 2 is conducted, and the key actors and their teams are explored. Section 4.2 introduces the

concept of innovation, and discusses the nature of innovation within the three levels of organisation. In section 4.3, the focus is on the Input-Process-Output (IPO) model of team innovation. As the theoretical framework of this study, the IPO model conceptualises team innovation in a knowledge-intensive context. Additionally, the model involves the big five and dark triad personality traits (inputs), innovation-related team processes (process) and team innovative performance (output). Section 4.4 includes the predicted hypothesis and provides background theoretical information and related research findings for the development of the hypothesis to address the research questions developed in previous sections. Section 4.5 describes and discusses the methods adopted in this latter study, and section 4.6 presents the findings related to study 2. Finally, section 4.7 is allocated to the discussion of the findings presented in the results chapter, stressing the implications and contributions of study 2.

4.1 KNOWLEDGE INTENSIVE CONTEXT

The main focus of study 2 is team personality composition in a knowledge-intensive context. Therefore, this section starts with an introduction to a knowledge-oriented work context and its differences from other work contexts. The emphasis is then firstly on knowledge-intensive firms operating in this particular context, and secondly on knowledge workers and the associated teams who operate in these firms.

Organisations have started to operate differently with recent changes and developments in their technological and economical environments. Particularly with the effect of globalisation, competition has become fiercer between economies and therefore between companies. In the new business era, factors like quality and quantity are entirely secondary; customer

loyalty and organisational focus depend more on creativity and the distinctive approaches of innovative companies (Bessant and Tidd, 2011).

In today's business environments, conditions are entirely different to those of the past. With the effect of industrial revolution, the economy of developed countries started to become organised. In these organised economies, firms were mainly capital-intensive. These organisations, which are broadly called bureaucracies, were managed by traditional management and organisation theory assumptions. According to these assumptions, employees were not able to take the initiative and were often seen as workers who are there to follow managers' orders (Cole, 2004, Body, 2008).

However, beginning with the late sixties and early seventies, post-modern thinking and approaches started to evolve (Blackler, 1995). In two decades' time, with the salient changes in society, technology and economy, the dominance of bureaucracies started to be questioned by both management academics and practitioners (Peters and Waterman, 1982). Currently, finding new ways of operating and attracting customers through newly-developed products and services is essential (Shipton *et al.*, 2005). To these ends, new knowledge needs to be created within organisations. Creation of new knowledge, changing faster than the markets, and competing with strong organisations is not compatible with traditional management approaches and bureaucracies (Hendry, 2006), because in today's turbulent business markets, organisations need to benefit not just from managerial ideas, but all workers' contributions as well. Hence, the controlling powers of managers needs to be decreased and organisations need to have flat hierarchical structures. What is more, communication flow should be free around the organisation, rather than rigidly structured one-way communication (Robertson and Swan, 2003a).

All of these developments have effectively directed key actors' attention to understanding the nature of knowledge and knowledge work in post-bureaucratic organisations with new managerial approaches. In addition, the strategic importance afforded to the generation of new knowledge by organisations has increased. It is also recognised that knowledge has a crucial effect on solving problems, innovating new approaches, products or services, and understanding changes in the environment (Nonaka and Takeuchi, 1995). Therefore, the mantra of "knowledge is one of the most crucial assets" is now being taken seriously by actors within competitive organisations.

The recent surge of interest in knowledge work has also heightened the strategic importance afforded to expertise and the critical knowledge of employees by organisations. Additionally, bringing knowledgeable workers together to interact, share and create knowledge for innovation became a high premium strategy for managers in non-traditional entities (Swan, 2011). Today, more and more organisations are encouraged to place greater emphasis on knowledge-oriented collaborations and transform them into knowledge-based, innovation-driven agencies (Swart and Kinnie, 2003; Wikstrom *et al.*, 1993).

The main focus of knowledge-intensive organisations is to adopt to fast-moving global markets, particularly through following changes in technology and science, as well as dealing with complexity, chaos, flexibility and disorganisation (Alvesson, 2004, Parker, 1992). Knowledge-intensive firms (KIFs), generally operate in turbulent environments and are defined as "*organisations where knowledge is used by intellectual and competent workers to create value and gain competitive advantage*" (Alvesson, 2004). Knowledge-intensive companies are the organisations that focus on innovation and knowledge creation. Management, engineering, IT consultancies, law or accountancy firms, research and development units and advertising agencies can be given as examples of knowledge work

organizations (Swart and Kinnie, 2003; Starbuck, 1992). Although estimates indicate that these firms employ 10-15% of the entire global workforce, they can be highly valuable and considerably influential. In fact, these firms can change the course of these industries through creating new knowledge and innovation (Alvesson, 2004).

As can be understood from the examples of KIFs, there are different types of knowledge-intensive firms according to their operative focus. In literature, there are distinct approaches to the question of how to classify these new types of firms. Lowendahl (1997), for example, categorises KIFs according to their strategic focus as Client-based (e.g. law and accountancy firms), Solution-based (e.g. management consultancy firms) and Problem Solving-based (e.g. advertising agencies, web design firms). However, it seems that not all researchers agree with her categorisation. Alvesson (2004) devised different types of classification, which divided knowledge-intensive firms into two types, which are professional service firms (e.g. management consultancies, advertising agents, etc.) and R&D companies, which encapsulates organisations that for the most part focus on tangible product innovation. While this latter taxonomy may be true and more simple than the former one, it also seems to exclude new types of knowledge-intensive firms which are internet-based, knowledge-intensive firms such as search engine firms (e.g. Google, Yahoo, etc.) or social media companies (e.g. Facebook, LinkedIn) (Prashantham and Young, 2004; Lyer and Davenport, 2008). Table 4.1 summarises all types of knowledge-based firms.

Table 4.1: Types of Knowledge Intensive Firms (KIFs)

Knowledge Intensive Firms	Examples	Strategic Focus
Professional Service KIFs	Management, Engineering or IT Consultancies, Law or Accountancy companies, Advertising agencies	Providing solutions to client firms.
Tangible Product Based KIFs *	R&D firms, Software Development Companies	New product development
Internet based KIFs	Social Media Firms, Internet based Search Engine firms etc.	Proposing new services to their customers or public through internet.

**The focus of this research will be on the second Tangible Product Based KIFs*

In these knowledge-based organisations, the emphasis is often on knowledge-oriented employees. Analytic, intellectual and theory-guided knowledge is the key factor and a distinct focus for KIFs in comparison to other agencies, where knowledge is seen as a primary means of production and accelerator of innovation. This knowledge is owned, captured, created and managed by knowledge workers, so that creativity and innovation occurs (Clegg *et al.*, 1996; Scarbrough, 1999) Therefore, knowledge workers are the most valuable assets of these organisations (Newell *et al.*, 2009). The definition of the term 'knowledge worker' encompasses highly-educated professionals who work in non-standard settings and apply theoretical and analytical knowledge to deal with complex tasks and new knowledge creation within their organisations (Drucker, 1994).

However, it is important to note that there is no precise, common description of knowledge-intensive firms and knowledge workers because there are different forms of KIFs that recruit different kinds of specialists. This has caused some researchers to argue that knowledge work is included in all sorts of work (Knights, Murray and Wilmott, 1993). Yet, here, the main focus is on firms that employ and benefit from experts whose knowledge and skills are often

the determinant factors of competitiveness and innovation. Software Development Engineers who work on new web design or Internet-based services, or other specialist engineers, designers responsible for new product development, or management consultants whose knowledge, expertise and creative problem-solving skills are crucial for client firms, can be given as examples of such experts.

In knowledge-based institutions, knowledge workers are also called 'gold collar workers' (Roe, 2001). They are scarce resources that are not easy to attract (Holland, Hecker and Steen, 2002; Alvesson, 2000). According to research carried out by the McKinsey Global Institute, there are 38 million knowledge workers worldwide, which represents 13% of demand (Dewhurst and Hancock, 2013). These companies invest significant amounts of money in these workers to attract and retain them as well as developing their skills to gain more benefit from them (Roger, 2013; Davenport, 2005). However, investing money is not the biggest challenge for managers. This type of organisation has distinct, creative and knowledge-based characteristics, and hence they are organised and managed differently.

As mentioned before, knowledge workers are seen as the most valuable asset in KIFs, and the nature of their work is about dealing with complex problems and ambiguous tasks by creating and innovating. Because of the complexity and ambiguity of their jobs they cannot be controlled directly, and performance measurement strategies for workers cannot be applied to their work (Alvesson, 2001). More to the point, managers often do not have the relevant knowledge; therefore, these gold collar workers enjoy freedom in their tasks and demand high levels of autonomy, resources and time from management (Monsted, 2003; Robertson and Swan, 1998). As a result, knowledge workers themselves manage (i.e., plan, control, organise) their tasks. In knowledge work literature, the privileged status of knowledge workers has widespread coverage. However, this may downplay the dark sides

of knowledge work. For instance, autonomy and power may not be as enjoyable as depicted in the literature. Owing to the complex and ambiguous nature of knowledge work, intensive job burdens often fall on the knowledge workers and, to protect their identity and power resources, knowledge workers may often give extreme levels of effort to muddling through. Therefore, their identity may also be vulnerable due to frustration (Alvesson, 2001; Alvesson, 2004). More to the point, it may even be difficult for knowledge workers to ensure work and life or family balance (Gill, 2010).

In the literature, it is argued that in knowledge-based organisations, management does not have the power; knowledge workers have it. Thus, management play a facilitator role in these organisations; in other words, creating satisfactory environments, offering new career development paths and providing necessary sources for knowledge workers are the main concern of management (Lyer and Davenport, 2008).

This kind of organisation also requires a distinct type of organisational structure, called the 'adhocratic form' (Mintzberg, 2011). Mintzberg (1983) calls these organisations adhocracies, which is used as a synonym for Knowledge Intensive Firms by some scholars (Newell *et al.*, 2009, Alvesson, 2004). Managers of adhocracies design the structure of their organisation to be as flexible and organic as possible, as well as suitable for intense formal or informal communication flow. Moreover, adhocratic structures require the provision of a high level of autonomy and an appropriate atmosphere for knowledge workers to accomplish their novel tasks (Mintzberg and Mchugh, 1985).

In innovation-driven organisations, knowledge-sharing is essential since it helps knowledge creation (Edwards,2007).Through innovation, these organisations can find ways to satisfy their customers and gain competitive advantage (Robertson, Scarbrough and Swan, 2003)

As can be understood, one of the other critical challenges to knowledge-intensive organisations is to foster knowledge sharing among experts, whilst at the same time keeping their best ideas secret (Monsted, 2003). As a result, managers should feel responsible for enabling effective ICT technologies within their company (Swan, 2011). On the other hand, it is argued that face-to-face interaction and sharing of knowledge is more efficient than communicating through databases (Dubrin, 2007). Therefore, the leaders of knowledge workers also need to foster knowledge exchange through personal and informal interaction. Additionally, to the same ends, adhocratic design and the culture of the organisation should be managed carefully.

Besides providing horizontal and team-based structures for knowledge work, focusing on cultural issues within the KIFs is also essential for creating an appropriate climate for innovation and knowledge work. For the new type of knowledge-based organisations, cultural normative controls have been suggested by scholars (Newell *et al.*, 2009; Robertson and Swan, 2003b). According to this approach, the leaders of these organisations should focus on forming a set of shared values and norms that attract gold collar knowledge workers who identify with, and thus increases their loyalty to, the organisation (Robertson and Swan, 2003b). However, this is not so easy, because it is rare that knowledge workers accept the constraints imposed by management. Management does not hold the power over orienting knowledge workers. Hence, they need to endorse a variety of different values and ideas of knowledge workers that cannot be easily transformed. Thus, the fragmentation perspective for organisational culture may need to be adopted, based on the idea that organisational culture is something that an organisation is, instead of has (Martin, 1992; Newell *et al.*, 2009). According to Martin (1992), in this type of organisational culture, values are dynamically created by members while they are experiencing each other, and shared in a fragmentary way, rather than in their entirety, across the organisation. Therefore, this view

acknowledges competing norms, ideas and value systems, and leaders of knowledge-creating companies need to accept that in these types of organisations, the culture can be loosely managed, as Newell and her associates (2009) stated, by developing one key value or belief that can be identified by knowledge workers.

Alvesson (2001) argues that managers of knowledge-based organisations should also hold themselves accountable for the effective identity management of their organisations. Strategic management of KIFs should focus on building an elite organisational identity to attract and retain competent gold collar workers (Alvesson and Robertson, 2006) since knowledge workers tend to work in elite firms which can secure their identity, employ highly-skilled workers and create an atmosphere to compete and develop their skills and knowledge through intensive interaction (Robertson and Swan, 2003).

All in all, a knowledge-intensive context and the firms and actors involved in this context have certain distinct characteristic features that brings new discussion and approaches to investigations of organisations and working life. The actors' capabilities towards the creation of new ideas and knowledge, as well their transformation to new offerings, is becoming the new focus of knowledge-intensive organisations. Therefore, bringing knowledge workers together, and the formation of effective teams, are the principle strategies of managers. Teamwork and effective collaboration, in particular, have been found to be amongst the key drivers of innovation (West, 2012; Zahavy and Somech, 2001). In effect, the formation of teams that can benefit from 'masterminds' and devise creative and innovative projects is a crucial challenge in this context (Newell *et al.*, 2009; Ichijo and Nonaka, 2009). To this end, the focal point of the present research is that of teams performing in knowledge-intensive

firms; the nature of teamwork in a knowledge-intensive context will be discussed in the next section.

4.1.1 Team Work in a Knowledge Intensive Context

Some researchers have begun to argue that it is time to reconsider our perception of teams, and there is a need to update how we look at teams according to recent changes in organisations and their approaches to teamwork (Murase *et al.*, 2012). The main reason for this change is because in the last two decades, competitive markets have become more innovation-driven, and organisations have had to consider redesigning their structures and strategies to become more innovative (Tissen, Andriessen and Deprez; 1998). Research shows that innovation is more likely to occur if knowledgeable people with distinct job-relevant expertise come together to share knowledge and perform effectively (Woodman, Sawyer and Griffen, 2002; Bell and Fisher, 2012; Tannenbaum *et al.*, 2012).

Knowledge worker teams are composed of knowledgeable experts and deal with complex problems. Distinct from other types of work teams, in a knowledge work context it is often highly-educated star performers that collaborate and act together (Mankins, Bird and Root, 2013). Therefore, one of the biggest challenges is to combine the individualistic skills that each knowledge worker brings and create a stronger and more effective team synergy.

In knowledge-intensive firms, the main target is to create new knowledge and to actively innovate. Hence, knowledge workers generally form a team in order to seek unknown knowledge for innovation. Therefore, teaming up is important for knowledge workers to first generate creative ideas, and then add value to those ideas via implementing them in an

effective manner. What is important here is that, although productivity is still important, it is downplayed by creativity and innovation in this context. Hence, the prior focus on innovation and performance assessment is mostly dependent on how innovative these teams are.

In knowledge-intensive organisations, the structures of teams are likely to be different compared to the ones in other organisations (Lindkvist, 2005). Mechanistic structures and well-defined tasks are the main characteristics of traditional teams. However, these characteristics are usually inappropriate to teams operating in a knowledge-intensive context. Instead, project-type organisation is found to be more appropriate to innovation-driven companies because it enables the open, networked and non-standardised environments necessary to, in particular, radical innovation. Thus, knowledge worker teams are formed in a more organic way. In other words, they have loose and autonomous structures. As knowledge workers have high degrees of freedom and control over their jobs, the teams they create are also designed to be autonomous. What is more, these teams are often designed in order to solve various complex problems and deal with ambiguous work-related issues. Therefore, the tasks in hand are often ill-defined and non-routine, as opposed to traditional work teams with mostly clearly outlined targets and routine job descriptions.

In innovation-oriented teams, more often than not, it is unusual for team members to have the all relevant knowledge (team's intellectual capital) for the creation of unknown knowledge. Thus, members' network and lobbies (social capital) can be extremely crucial to these teams in order for members to reach, learn and apply the deficient knowledge to achieve their task (Newell *et al.*, 2009). Additionally, project-based organisation enables team members to use their autonomy and discretion so that new knowledge can be created. While doing this, it is also essential to bring together appropriate members with the diverse skills and knowledge crucial to achieving the aims of the project at hand (Mintzberg and

McHugh, 1985). Thus, task related diversity had been found to be crucial for teams operating in knowledge-intensive contexts.

However, heterogeneous combination can be achieved either by highly mechanistic or organic means, through use of multidisciplinary or transdisciplinary teams, respectively. Multidisciplinary teams have members with different expertise and backgrounds, and are only responsible for their particular tasks during teamwork. This type of collaboration does not necessitate a high level of interaction between individuals (Van Der Vegt and Bunderson, 2005). Conversely, transdisciplinary teams are defined as teams whose members, again, have mostly different backgrounds and skills, but are mutually responsible for the outcome of their project. Hence, the interaction between members is expected to be high in this type of teams (Stokols *et al.*, 2008) innovation and new knowledge creation is more likely to occur in transdisciplinary teams, rather than multidisciplinary ones, because in this type of teamwork, the knowledge that comes from different individuals with different expertise and experience is integrated more dynamically through intense communication, so that new types of knowledge and ways of doing things can be created (Newell *et al.*, 2009).

The interaction, knowledge-sharing, formal and informal dialogues are found to be crucial in creating new knowledge and eliciting innovation (Nonaka and Takeuchi, 1995). Therefore, in knowledge-intensive organisations, knowledge workers generally work in teams so that they can easily share information and create new knowledge (Mohrman, Cohen and Mohrman, 1995; Fox, 2003). Additionally, cognitive cohesion (team cognition) among team members in knowledge worker teams is essential to the circulation of knowledge in the team and the development of its overall synergy. Yet it is not so easy to create this synergy, because members of such teams generally come from different backgrounds, which creates knowledge boundaries that team members need to overcome to share deep tacit knowledge

and develop new shared meanings. Scholars suggest continuous collaboration for prolonged periods through transdisciplinary work (Newell *et al.*, 2012; Sijtsema *et al.*, 2011). Additionally, development of trust among members is also seen as essential (Newell and Swan, 2000). After the development of shared meanings, interaction and knowledge-sharing among members becomes more effective. To this end, members can share knowledge over and above that expected from each individual as relevant to their specific tasks.

Furthermore, it is argued that an enabling context also needs to be provided which involves physical, virtual and shared mental space to ensure effective interaction among knowledge workers (Johns and Gratton, 2013). As can be understood, along with face-to-face interaction, active usage of information and communication technologies can also be essential. Moreover, creation of a shared mental space (i.e., shared understanding, ideas, emotions) is particularly important to the process of knowledge creation (Nonaka and Konno, 1998). Mental models helps the group of individuals to reach its predetermined objectives. Hence, it is crucial that members need to acknowledge and understand each others' knowledge within the team (He, Butler and King, 2007). At this point, some members' wider intellectuality and understanding capabilities (t-shaped skills) can facilitate knowledge flow within the team so that shared understandings can be gained regarding the situations faced by the team (Leonard, 1998).

Moreover, in diverse, innovation-oriented teams, the intense interaction and discussions may result in some task-related conflicts among knowledge workers, also known as "creative abrasion". This type of conflict between team members, who don't know each other well and have different knowledge with diverse backgrounds, are likely to occur. Yet it is argued that management should not interfere with creative abrasion as it facilitates the development of creativity within the team (Oster, 2011).

On the other hand, it is also important to note that there are a number of factors that can easily have a negative impact on the creation of new knowledge and the development of new products or services within these teams. The most important of these is knowledge boundaries. According to Carlile (2002, 2004) there can be up to three boundaries that can affect the dialogue, interaction and knowledge-sharing within a team; additionally, these boundaries can change according to the novelty of the task the team is facing. The first boundary is the easiest one to overcome, known as the 'syntactic boundary,' that develops due to any language differences among team members, so that misunderstandings can happen. The second boundary is the 'semantic boundary'. This type of boundary comes into existence owing to the distinct interpretations and meanings given by members. In such boundary situations, members may have difficulty in understanding each other and building common understanding, therefore members' knowledge cannot be easily shared. Carlile argues that in these situations, the information that members have needs to be translated so that individuals may find the opportunity to recognise the different ideas and approaches of others. The third boundary is the 'pragmatic boundary'. This type of boundary generally occurs in novel tasks because of the different interests of the members. In such complex situations, language translation may not be enough for the parties involved, and knowledge transformation may become necessary to convince members towards common action (Carlile, 2002, 2004). Along with these knowledge boundaries, power dynamics, groupthink, group polarisation and conformity issues (mentioned above) within the team can also have a detrimental effect on knowledge creation.

With regards to leadership and control, it is argued that leaders do not have much power over knowledge workers. Indeed, because these teams are composed of highly independent individuals, the leader does not have much authority to control knowledge workers. As a result, some scholars argue that concrete control is more likely to occur among

knowledgeable experts when they form a team (Courtney *et al.*, 2007). Additionally, because each individual member's skills and expertise can be crucial depending on the problem encountered, continuous power redistribution is likely to occur within knowledge worker teams (Newell *et al.*, 2009).

When it comes to leadership, more visionary, cooperative and participative styles are found to be favourable in a knowledge-intensive context. To this end, transformational leadership can be considered as an umbrella leadership concept that is widely associated with innovation-oriented, postmodern organisations (Gumusluoglu and Ilsev, 2009). Transformational leaders lead their teams toward innovation through articulating a compelling vision, building constructive relationships and both inspiring and intellectually stimulating the members of the team (Karakitapolu-Aygun, Gumusluoglu, 2013; Eisenbeiss, Van Knippenberg and Boerner, 2008; Paulsen, Callon, Ayoko and Saunders, 2012).

Table 4.2: A table of Comparison Between KWTs and TWTs

Knowledge Worker Teams (KWTs)	Traditional Work Teams (TWTs)
The main focus is on new knowledge creation and innovation (Nonaka and Takeuchi, 1995)	The main focus is effective and efficient teamwork (West, 2012)
Work in various, uncertain and challenging tasks (Janz, et al, 1997)	Work in well-defined and routine task.
Functional diversity leans towards being high. (Cross-functional or even cross-organisational teams). Therefore, there can be high level of knowledge boundaries among team members. (Lewis, 2004)	Functional diversity is low. (Departmental teams)
Networking is crucial to fill knowledge and expertise gaps (Newell and Swan, 2000).	These teams tend to be internal and networking is not crucial.
Cognitive cohesion and synergy is essential for innovation (Sijtsema et al, 2011; Mankins et al, 2013)	Social cohesion and synergy is essential for efficiency.
Deep tacit knowledge exchange (Shani, Sema & Stebbins, 2000)	Explicit knowledge exchange.
Continuing redistribution of power among team members	Team leader or the manager has the power.

Transformational leadership is appropriate type for KWTs. These teams are highly autonomous therefore concertive control is likely to be occur among team members (Courtney et al, 2007)	Leaders of these teams have often more directive style.
There is often continuous collaboration and knowledge flows (Sijtsema et al, 2009)	Low-level mutual interdependence and little knowledge exchange.

All in all, gathering these experts within groups may not be enough for team innovation (Knippenberg, De Dreu and Homan, 2004; Fay, Borrill, Amir, Haward, West, 2006; Tannenbaum, Mathieu, Salas, Cohen, 2012) since individuals may have different backgrounds, and this can create some unique challenges to effective teamwork. Accordingly, social categorisation theory argues that individuals are prone to simplify and categorise members of the group. Thus, they comply with in-group members rather than out-group ones (Tajfel and Turner, 1986). Moreover, even knowledge workers may experience difficulties in fruitful interaction and knowledge-sharing, as well as cohesion within the team (Milliken and Martins, 1996; Van der Vegt and Janssen, 2003). Therefore, innovation-related team inputs and processes may enable innovation within organisational groups (Guzzo and Shea, 1992, West and Anderson, 1996; Maier *et al.*, 2015).

4.3. TEAM INNOVATION

The word ‘innovation’ is derived from the Latin verb “*innovare*” or “*innovus*”, which means “to make something new” in modern English (Tidd, Bessant and Pavitt, 2007). In general, it refers to the development, creation and application of new ideas, processes, procedures or products that serve the purpose of individuals, groups and/or organisations (Maier, Hulsheger, Anderson, 2015; West and Farr, 1990). When innovation is the focus, creating

new ideas alone is not enough; these ideas need to be applied to generate any value from them (Magadley and Birdi, 2012).

Indeed, innovation is a complex phenomenon and can be scrutinised at various levels (individual, team, organisation, industry, consumer group, region and nation). However, within the organisational system, there are three levels of innovation. These are the individual, team and organisational levels of innovation (Woodman, Sawyer and Griffin, 1993; Crossan and Apaydin, 2010; West and Altink, 1996). All levels of analysis involve new ideas, processes, procedures or product development, or creation and application processes. Individual level innovation implies a set of individual behaviours that are related to the idea generation and implementation (Scott and Bruce, 1994, McAdam and McClelland, 2002; Janssen, 2003). Team-level innovation is generally defined as the intentional introduction and application of new and useful ideas, processes, products and procedures within an organisational team (West and Farr, 1990; Caldwell and O'reilly, 2003; Hulsheger, Anderson and Salgado, 2009; Somech and Zahavy, 2011). Lastly, the macro-level analysis includes organisational innovation and it refers to the adaptation of an internally generated or purchased value added idea, procedure, process or product which is new to the organisation (Damanpour, 1991; Crossan and Apaydin, 2010).

Figure 4.1: Three Levels of innovation



In the present research, the unit of analysis and the scope is be on team level innovation within the organisational phenomena. Although recent research has revealed various aspects influencing innovation in this meso-level, considerable attention has been given to particular antecedents of team innovation that were assembled in a study conducted by Hulsheger and co-workers (2009). These influencing factors are separated into input and innovation-related team processes to be placed within the input-process-output model of team innovation. This type of classification is also consistent with the aims of the present research as this also uses the IPO model to conceptualise the relationship between personality, team processes and innovative performance.

When it comes to input variables and their relationships to team level innovation, there are various aspects that have attracted the attention of researchers. Previous investigations mostly focus on the group heterogeneity, task and goal interdependence, task complexity, team size and knowledge skill and ability of team members (Curral *et al.*, 2001; West, 2002; Hulsheger *et al.*, 2009). Heterogeneity, and its association with team-level innovation, is

emphasised by scholars, and there are two distinct types of diversity defined within the literature. The first of these is task-related diversity, which represents the variation in task-related knowledge, skills and abilities among team members. The second type is Demographic diversity, which involves factors like age, gender and ethnicity, all of which are unrelated to team tasks (Maier *et al.*, 2015, Hulsheger *et al.*, 2009). Research shows that task-related diversity brings various perspectives, skills and networks together, and creates a synergy that promotes team innovation (Jehn *et al.*, 1999; Hulsheger *et al.*, 2009). On the other hand, when there is a demographic diversity within a group, then the predictions and findings are quite the opposite (Knippenberg, De Dreu and Homan, 2004). In fact, it is argued that similarities, particularly in observable characteristics such as age, gender and ethnicity, increase the inclination of members towards fellow team members who are similar to themselves (Tajfel and Turner, 1986). As a result, when demographical diversity is considered within a team, homogeneity is preferred, as it results in team cohesion (O'Reilly, Caldwell and Barnett, 1989) and member commitment (Riordan and Shore, 1997).

Moreover, task and goal interdependencies are other factors that have been investigated in the previous literature related to team innovation. Task dependency is concerned with interdependency among group members for the effective accomplishment of the task at hand (Maier *et al.*, 2015). Saavedra and co-workers emphasise the possibility of a two-way effect of task dependency. The positive impact is on cooperation, satisfaction and performance, whilst the negative influence is via reducing individual contribution and initiative (Van der Vegt and Van de Vliert, 2002). Goal interdependence, on the other hand, refers to the extent to which interconnection between individual goals and team goals is such that the accomplishment of members' goals is dependent upon the achievement of other members' goals within the group (Van der Vegt and Van de Vliert, 2002). Research findings have demonstrated that goal dependency promotes communication and cooperation among

team members (Van der Vegt Van de Vliert, 2002) and, in addition, innovation (Hulsheger *et al.*, 2009).

Team size and team longevity are also considered significant input factors within team innovation-related investigations (Curral *et al.*, 2002; Stewart, 2006). Findings related to the first input factor, team size, shows that there is a positive correlation between team size and innovative performance. Larger teams have the potential to be more innovative than small ones due to the wider range of skills, knowledge, network and abilities that the larger teams will naturally possess (Stewart, 2006; Hulsheger *et al.*, 2009). Turning to the second aspect, the arguments and findings on team tenure indicate a negative relationship with innovative efforts of teams. In their well-known study on team innovation. West and Anderson (1996) argued, and found, that in due course, teams become less innovative and unable to develop alternative means to challenge the status quo. In fact, this factor was also tested on knowledge workers in an R&D context by Katz in 1982, and the results were in line with West and Anderson's study.

In addition, effective functioning of the team processes and team innovation may in turn depend on personality composition as an input variable. Although the variables above are well studied, there has been scant attention paid to the role of personality traits on team innovation (Mohammed and Angell, 2003; Betchtold *et al.*, 2007). For this reason, the current study concentrates on the direct or indirect influence of personality composition as an input factor on the innovative output of knowledge work teams.

Turning to the innovation-related process factors, the four innovation-related team climate factors are considered to be solid factors for team innovation (West and Anderson, 1996). Team climate is defined as "*shared perceptions among group members with respect to their*

relationships, their tasks and their work environment" (Maier *et al.*, 2015, p.215). In a well-known study of team innovation, West and Farr (1990) identified four distinct climate-related antecedents of team innovation for the first time. These four determinant factors are shared objectives, participative safety, task focus and support for innovation.

Moreover, in a following notable study undertaken by Hulsheger, Anderson and Salgado (2009), these four team climate dimensions and other influencing process-related factors (team cohesion, team communication, task and relationship conflict) were assembled under the same roof as innovation-related team process variables. As a point of fact, in this study, additional team processes were carefully examined and found to be strongly correlated with team innovation (Hulsheger *et al.*, 2009; Maier *et al.*, 2015). Drawing on this, these team processes have been adopted in the present study and their mediating role between personality composition and the innovative performance of knowledge worker teams is examined.

Recent research shows that personality may have a significant impact on team functioning and performance (Barrick *et al.*, 1998; Neuman, Wagner and Christiansen, 1999; Peeters *et al.*, 2006; Lepine *et al.*, 2011). Therefore, team personality composition can also be considered as a vital input that may have a direct or indirect (through team processes) impact on team outputs (Van Vianen and De Dreu, 2010). In fact, research has found team-level open mindedness to be a determinant factor in avoiding problems created by the distinct backgrounds and identities of individuals (Mitchell and Boyle, 2015). What is more, knowledge worker teams mostly designed with loose structures and formed to solve indefinite and complex problems may create more challenging dynamics with regards to group conflicts, communication and task focus (Hulsheger *et al.*, 2009). Research on team personality composition and performance involves considerable findings regarding the

positive influence of agreeable people on team cohesion and cooperation, extraverts on team communication, conscientiousness on task focus, openness on creativity, and so on. However, in the literature, there are a number of other arguments related to psychological issues in a knowledge-intensive context, and it is argued that in this highly intellectual context, psychological factors like personality and cohesion in teams are downplayed by professional attitudes and responsibilities (Newell *et al.*, 2009). To the best of my knowledge, there is no prevailing study that probes the interaction between personality composition, team processes and innovative performance in this specific context. Hence, having considered these conflicting views, this study is designed to investigate the roots of these arguments and shed light on the association between personality, team processes and the innovative performance of teams composed by knowledge workers. In order to conceptualise this relationship, the extended input-process-output framework is used.

4.4. THE EXTENDED IPO MODEL OF TEAM INNOVATION

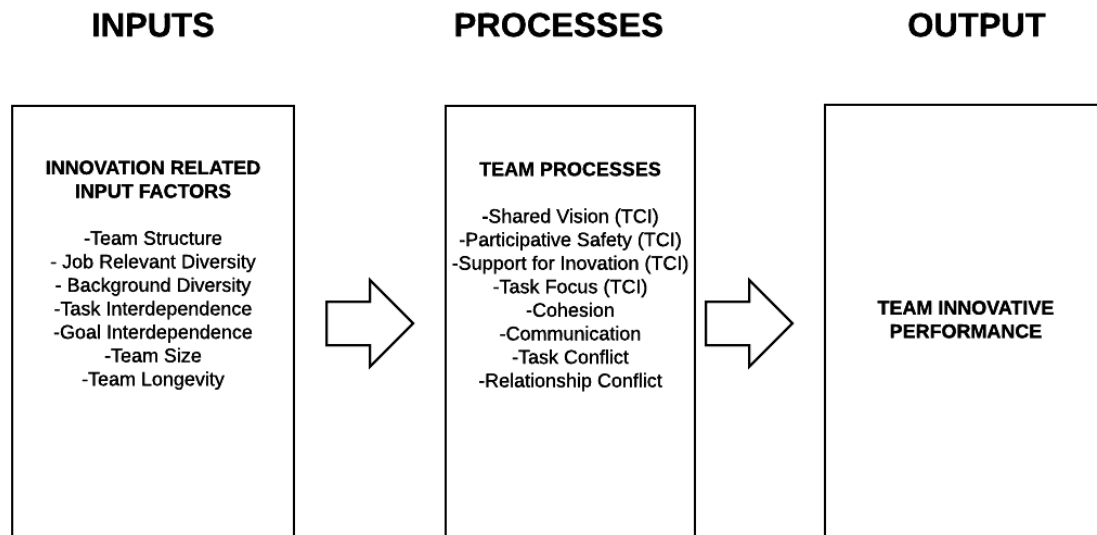
In this section, the extended input-process-output model of team innovation will first be explained; thereafter, the factors that exist in the model and research hypotheses will be introduced.

4.4.1 An Input - Process - Output Model as a Conceptual Framework for This Study

The Input-Process-Output (IPO) model was created by Hackman and Morris (1975) to explain team effectiveness. The main argument of the IPO model is that input factors have an impact on the group process factors, through which the output of the group is influenced (Hackman, 1987). This model is found to be the most appropriate for the conceptualisation

of team effectiveness (Guzzo and Shea, 1992). The IPO model is a well-used conceptualisation framework, and it was used to understand determinant factors of team performance. For instance, in order to explain personality and team performance relationship, Van Vianen and De Dreu conducted a study in 2001 investigating the associations between the big five personality compositions (input), social and task cohesion (processes), and team performance. Then, it is used as a framework to explain team innovation (Curral *et al.*, 2001; West and Anderson; 1996). In the study of West and Anderson (1996), this framework is used to explain the relationship between group composition, organisational context as input factors, group processes (shared vision, participation, task focus and support for innovation) as process factors and number of innovations as group outputs. Their study focused on top management teams, and showed the relationship between team size (input), participation, task focus, support for innovation (group processes), and team innovation (output). Furthermore, Curral and colleagues (2001) used the IPO model by means of using different inputs (size, task type and sector) and the same process factors. As a result of this study, significant relationships were found between task type, team size (input) and innovation-related group processes (process). Another study conducted by Hulsheger and co-workers (2009) introduced the extended conceptualisation of the IPO model in order to examine the role of additional variables that have, for the most part, found to be crucial to team innovation within the literature.

Figure 4.2: Extended IPO Model of Team Innovation (Hulsheger, Anderson, Salgado, 2009)



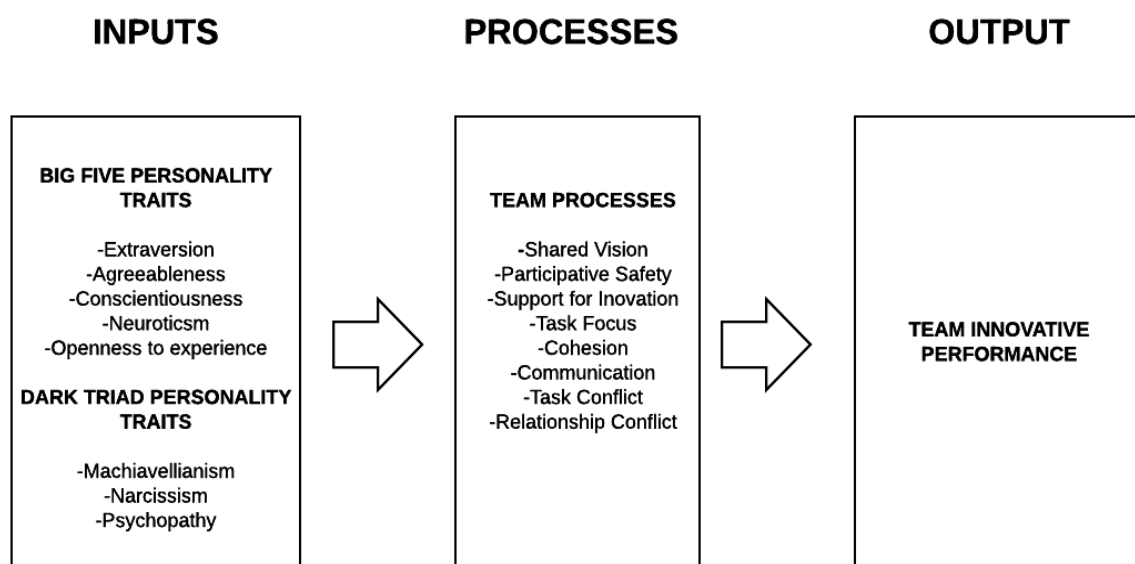
The studies mentioned above stressed the requirement for further research on various factors' influences on group processes and team innovation. To the best of my knowledge:

- There is no study investigating the association between personality composition and innovative performance of teams in a knowledge-intensive context;
- There is no research that probes the relationship between personality composition, extended innovation-related processes and team innovative performance through use of the IPO model.

However, as previously mentioned, personality composition can be a crucial input factor which may have a stimulating power on team processes and team performance (Van Vianen and De Dreu, 2001; Barrick *et al.*, 1998 and Barry and Stewart, 1997). In addition, there is a need to see the power of personality composition on team process and performance variables in a knowledge-intensive context (since it is crucial to understand the role of personalities of knowledgeable experts when they come together to innovate). There is a need, however, to examine the argument of psychological factors as personality is

downplayed by professional attitudes and responsibilities of knowledge workers (Newell *et al.*, 2009) through solid scientific research using the widely-used and accepted IPO model of team innovation (West and Anderson, 1996; Hulsheger *et al.*, 2009, Van vianen and De Dreu, 2001). As a result, the present study uses the Input-Process-Output model to examine the relationship between personality traits (big five and dark triad), extended innovation-related group processes, and team innovative performance in knowledge-intensive contexts.

Figure 4.3: Extended Input - Process - Output Model of Knowledge Worker Team Innovation



4.4.2 Input: Knowledge Worker Team Personality Composition:

Diversity is defined as a "*distribution of personal attributes among interdependent members of a work unit*" (Jackson, Joshi and Erhardt, 2003:802). It includes age, gender, ethnicity, knowledge, skills and personality differences. A considerable number of researchers are inclined to divide these personal attributes into two groups, called surface and deep level

diversities (Phillips and Loyd, 2006). While surface level diversity includes demographical factors such as age, gender, and ethnicity, the deep level diversity factors include knowledge, skill set and personality traits (Harrison, Price and Bell, 1998; Phillips and Loyd, 2006).

As distinct from study 1, this study focuses on the impacts of personality diversity and mean-level composition on knowledge worker teams' innovative performance. In other words, it aims to examine the personality and innovative performance relationship in a real, knowledge-intensive business context. That is to say, this study benefits from big five and dark triad personality trait taxonomies, which are a widely-known and accepted way of conceptualising individuals' personalities within the teamwork context (McCrae and Costa, 1992; Robertson, 2002). Thus, as shown in figure 4.3, once again, the big five personality traits (extraversion, agreeableness, conscientiousness, neuroticism and openness to experience) and dark triad personality traits (machiavellianism, narcissism and psychopathy) are used to determine and measure team members' personalities.

When the focus is innovation, developing new and exciting ideas is not the only challenge for teams; the members may also need to add value to these ideas and bring them to life through an implementation process (West, 2002). Hence, having included both stages of team innovation, this study will relate team personality composition with team innovative performance, as distinct from study 1.

Personality research, particularly in a work context, has made excellent progress; a considerable amount of research in this regard has, to date, already been completed. As mentioned before, the big five personality traits model is the most accepted model in personality research. There is also some research in the literature that looks at the big five

personality traits in organisational teams (Barrick *et al.*, 1998; Halfhill *et al.*, 2005; Peeters *et al.*, 2006; Lepine *et al.*, 2011). The dark personality traits, on the other hand, have received little attention among the workplace investigations. Dark personality traits are defined as the “*traits that fall between normal (ex: big five) and abnormal (borderline personality disorder) personality characteristics*” (Applied Psychology, 2011).

The most well-known characteristics for these personality types are Machiavellianism, Narcissism and Psychopathy (Paulhus and Williams, 2002). Paulhus and Williams (2002) used the “dark triad” term for people who have a “*tendency to be callous, selfish, and malevolent in their interpersonal dealings*” (p. 100). In the literature, the general focus has been on the negative effects of dark triad personality (O'boyle, Donaldson, Banks and McDaniel, 2012). Nathanson's research (2008) indicates that Machiavellians are prone to take revenge against others, and are more likely to tell lies to the people in their environment (Kashy and DePaulo, 1996). Narcissists, on the other hand, can be mean and aggressive when their egos are threatened (Miller, Widiger and Campbell, 2010). Psychopathy is associated with unethical and inconsiderate behaviour (Nathanson, Paulhus and Williams, 2006). However, there are some studies which also show some null or positive relationships with impression management (Vohs, Baumeister and Ciarocco, 2005), self-promotion (De Vries and Miller, 1986) and even leadership (Ames, 2009). Studies that have been carried out on this subject show that the dark triad approach has the potential to help researchers to better understand personality issues in organisational phenomena. Furthermore, recent research conducted on the subject of “dark triad in organisations” emphasised the need for future investigation regarding the effects of dark triad personality traits on team dynamics and performance (Wu and Lebreton, 2011; O'Boyle *et al.*, 2012). Therefore, this research also investigates these personality traits to help understand how the dark triad affects

innovation-related group processes, which in turn leads to innovative performance of knowledge workers.

4.4.3 Process: Innovation Related Group Processes

In this section, the main focus will be the processes part of the Input-Process-Output model of team innovation. Process refers to mutual transactions of team members such as knowledge-sharing, participation and support levels within the group (Hulsheger *et al.*, 2009). The team processes predicting innovation will be examined in this section. The first four process factors are determined by the early study of West in 1990. Later, the innovation-related processes were validated by West and Anderson's (1998) research and named as Team Climate Inventory (TCI) factors, which have subsequently gained recognition from other researchers (Brodbeck and Maier, 2001; Bain, Mann and Merlo, 2001; Mathisen *et al.*, 2004). In addition, and more recently, three other group process factors were illustrated by researchers to be predictors of innovation (Hulsheger *et al.*, 2009). Hence, as distinct from previous innovation-related Input-Process-Output studies, this research includes three additional process variables, which are team social cohesion, internal and external communication (Woodman *et al.*, 1993), and task and relationship conflict (De Dreu, 2006).

4.3.3.a) Shared Vision (TCI):

Team vision can be created through the determination of a clear set of goals, priorities and true comprehension of the objectives of the organisation and the project itself (Revilla and Rodriguez, 2010). Team vision has a considerable influence on teams. It has been argued that if a team has a clearly-stated vision that has also been acknowledged and internalised by the team members, it can play a significant role in the innovative performance of the team (West, 2002).

Clearly stated team objectives may develop focused idea generation within the team, and team members will actualise these ideas with enthusiasm (Pinto and Prescott, 1987). Therefore, building a shared understanding is crucial for team innovation (West and Anderson, 1996, Gilson and Shalley, 2004). On the other hand, if members of the group fail to develop a shared vision, their efforts may not be channelled towards innovative ends, and conflict and decomposition may occur.

4.3.3.b) Participative Safety (TCI):

Building a safe and participative climate in a team is crucial to the belief that any member of the team can share his/her thoughts with the rest of the group (Edmondson, 1999). This may lead to a high level of participation in the team, which is important for developing creative ideas and increased commitment to the implementation of these ideas (Amabile, 1997). In other words, if the atmosphere in a group is open, friendly and supportive, as well as intellectually intensive, then innovation is more likely to occur (West, 2003). Claxton (1997,1998) and Jehn's (1995) research supports this idea, and states that when there is no pressure, and people feel safe and work in a positive environment, they can easily share information, interact and discuss with each other, and creativity will occur and innovation will follow (Keller *et al.*, 1996).

4.3.3.c) Support for Innovation (TCI):

Safety and a high level of participation in a group is important to create the appropriate conditions for innovation. However, mutual support and encouragement are also vital factors that allow teams to be innovative. As mentioned before, innovation is divided into two major processes, which are idea generation and implementation. Adequate levels of support in a group will assist the transition from the development of ideas to the actual implementation of these ideas (West, 2012; West and Hirst, 2003). Michael West defines support for innovation

as “*expectation, approval and practical support of attempts to introduce new and improved ways of doing things in the work environment*” (West, 1990, p. 315). In supportive climates, false attempts at innovation are often tolerated and members are encouraged to take the initiative, risks, and come up with new ideas.

West (1990) argues that the groups in which proposals about new ways of doing things are ignored will be desperate for innovation. Therefore, practical and verbal support given by team leaders, members and managers is crucial to developing creative ideas and putting them into action. As a result, it can be argued that verbal support is particularly important for the development of creative ideas. In addition, practical support is essential for the development of ideas and subsequent implementation activities, since it may stimulate cooperation for creation of new ideas and also trigger the implementation process (West, 2012).

4.3.3.d) Task Focus (TCI):

As mentioned before, teams may also create various disadvantages for themselves and the organisations they work for. Groupthink, conformity, high levels of cohesiveness and participative safety may inhibit the innovative performance of teams (Newell *et al.*, 2009).

Thus, it is crucial that team members have a common concern about their teams' tasks, targets and quality of their performance (Hulseger, Salgado and Anderson, 2009).

West (2001) argued that a climate of excellence and task focus motivates teams to build or adapt systems for evaluation, modification and control. Moreover, task focus also lead teams to be reflexive about their tasks. Team reflexivity can be defined as a critical appraisal process; in this process, objectives, strategies and procedures are reflected upon and the performance of the team is evaluated by its members (West, 2012). The reflexivity process,

therefore, enables a team atmosphere in which diverse ideas are equally discussed and alternative ways of approaching problems are generated, and hence the innovative performance of the team may increase (Tjosvold, Tang and West, 2004).

4.3.3.e) Team Social Cohesion (Additional team process):

A considerable amount of research has been conducted into team cohesion, and it is one of the most widely studied group process factors (Kozlowski and Bell, 2003). Social cohesion of the group refers to members' attraction to the group itself, and their desire to be a part of the team (De Dreu, Annelies and Vianen, 2001; Hulseger *et al*, 2009).

Researchers studying knowledge work and innovation contexts tend to argue that interpersonal (social) cohesiveness is positively related to team innovative performance (Keller, 1986; Woodman *et al.*, 1993; Huang, 2009). Increased attraction among group members may facilitate knowledge-sharing and building shared cognition among members (Hulseger *et al.*, 2009). It is also important to note that a number of researchers have pointed out that a high level of team cohesion may reduce task-related discussions and alternative proposals that do not harm the cohesive climate of the team (Sethi, Smith and Park, 2002). Therefore, it can be argued that team social cohesion is essential for innovation only so long as it does not develop conformity in the team.

4.3.3.f) Team Communication (Additional team processes):

Teams need to have an adequate level of communication and interaction to perform their tasks effectively. Research also shows that, in complex projects, intensive levels of formal or informal communication are crucial to the sharing of knowledge and development of new approaches for particular tasks and problems (Edwards, 2007; Keller, 2001).

Moreover, besides internal communication, external communication is also crucial for the team to be innovative (Ancona and Caldwell, 1992). As previously mentioned, knowledge worker teams often deal with ambiguity and new kinds of complex problems that they have never experienced before. Hence, somewhere along the line, these types of innovation-oriented teams may need different sources of expertise that their current members do not have. At that time, team members have to network and communicate with external actors to receive any support for the issue encountered (Newell, 2009). Furthermore, information flows and interaction with other teams and projects may also help the team to gain new knowledge and discover alternative ways of dealing with tasks (Newell and Swan, 2000; Keller, 2001).

4.3.3.g) Task and Relationship Conflict (Additional team process):

Conflict is in the nature of human interactions, and broadly refers to misalignment of the interests and ideas of related actors (Martin and Fellenz, 2010). At face value, conflict could be perceived as a factor that have a negative influence on teamwork. However, researchers argue that conflict can actually increase the innovative performance of teams. It is claimed that when conflict is related to group tasks, it may foster discussion and knowledge-sharing and help team members to discover new approaches and alternative ways of looking at things (Shaley and Gilson, 2004; West 2002;). Mintzberg (1983) claimed that in knowledge-intensive contexts, conflict among workers is necessary. However, it is also important to note that this conflict should not be related to the relationships between team members. In other words, team members should accept task-related conflict as long as it does not harm the personal relationships among team members.

In the literature, conflict is divided into two different sub-concepts, which are task-related conflict and relationship conflict. Task-related conflict in groups refers to dissensus and clashes among team members. On the other hand, relationship conflict is defined as social and emotional debates and controversies among team members (Jehn, 1995; De Dreu and West, 2002). It has been argued that while task-related conflict is appropriate for team innovation, relationship conflict is generally seen as a diminishing factor for innovativeness (Jehn, 1995; De Dreu, 2006; Hulsheger *et al.*, 2009).

4.3.4 Output: Innovative Performance of a Knowledge Worker Team

This section will place an emphasis on team outputs. Team outputs can include various factors, such as productivity, wellbeing, satisfaction, innovation, etc. For study 1, the focus was on team innovative performance as an outcome. West and Farr (1990) defined innovation as the intentional introduction and application within a job, work team or organisation of ideas, processes, products or procedures which are new to that job, work team or organisation and which are designed to benefit the job, the work team or the organisation. Most scholars accept that innovation is not a linear process, and consists of two different parts, which are creativity and implementation (West, 2002). Creativity, in this context, refers to the generation of new, useful ideas and it is considered as a starting activity to innovation (Birdi, Leach and Magadley, 2012). However, creating new ideas is not adequate on its own, as their implementation is required to finish the innovation process (Magadley and Birdi, 2012).

In the current research, the output measurement is on team level innovation, and the focus is be on *ad hoc*, knowledgeable, expert groups working in knowledge-intensive firms. Therefore, the number of creative ideas, new products and process improvements

developed by knowledge worker teams will be factors by which to measure innovative performance (West and Wallace, 1991; Hulsheger *et al.*, 2009).

Innovative performance of knowledge worker teams is crucial for the existence and competition of knowledge-intensive organisations (Newell *et al.*, 2009). As mentioned previously, they are different from the teams in traditional organisations (Sapsed *et al.*, 2002; Lindkvist, 2005; Tannenbaum *et al.*, 2012). Therefore, in relation to Mohammed and Angell's (2003) further research proposal, team-based, knowledge-intensive companies, where knowledge workers perform for innovation, can form a different context to investigate. This new type of context is crucial because the main focus of organisations operating in knowledge-intensive sectors is innovation, which may have a crucial impact on economical, technological and societal developments (Jaumotte and Pain, 2005; Black and Lynch, 2001). Furthermore, although considerable research has been devoted to the understanding of team dynamics and the importance of diversity on work team performance, as stated by Bechtoldt and his associates (2007), the effects of personality factors on creative performance and innovativeness has been essentially ignored. As discussed previously, the effective composition of a team has a considerable impact on the team's ability to perform well, and the determination of the team members' personalities is one of the most essential steps in this regard. More to the point, the tendency of an individual to act in a certain way and interact with others in an effective way is a function of their personality (Kichuk and Weisner, 1997). Hence, personality factors have an effect on knowledge worker teams (as dynamic, less-structured and intense interaction-oriented groups), and their innovative performance can be researched. Thus, I conducted this research project on team-based, knowledge-intensive firms to examine personality factors, their combination in knowledge worker teams and their relation to the creative performance of these teams.

The research questions for study 2 are:

1) *How does knowledge worker team personality composition relate to the innovative performance of a knowledge worker team?*

--- *Is there any relationship between the mean level of personality traits and innovative performance of a knowledge worker team?*

--- *How does variability in personality traits affect the relationship between mean level personality traits and innovative performance of a knowledge worker team?*

2) *How is the relationship between personality traits and innovative performance of a knowledge worker team explained by innovation-related group processes?*

As a result, this study aims to contribute to the team composition and performance literature through examining knowledge worker teams working in knowledge-intensive contexts. As stated above, these teams show considerable differences with teams in other contexts. Hence, this study can explore new and different correlations between personality traits and team innovative performance, thereby contributing to the existing research while examining past assumptions in a different context, through the investigation of knowledge worker teams.

4.5. DEVELOPMENT OF RESEARCH HYPOTHESES

This section will discuss the relationships between input (personality traits), processes (innovation-related group processes) and teams' innovative performance. Additionally, this section will introduce the research hypotheses. However, given the large number of relationship possibilities within the extended IPO model, this research addresses the relationships that are theoretically relevant.

In this collateral study, hypotheses are built in terms of two different aspects of team composition. The first aspect is that of personality trait levels of knowledge worker teams. These levels will be determined by adding each member's scores and finding the average score for a trait for a particular team. Present research aims to investigate the relationship between high, moderate or low levels of big five personality traits and teams' innovative performance. Additionally, innovation-related group processes are considered as mediators of this relationship.

The second aspect is about the variability (diversity) of members' personalities in a team and its relationship with knowledge workers' innovative performance. In other words, this aspect will focus on personality heterogeneity or homogeneity in knowledge worker teams and its effect on innovative outcomes. Personality heterogeneity refers to team members' differences in personality. In contrast, personality homogeneity refers to similarities of team members in personality (Mohammed and Angell, 2003; Glomb and Welsh, 2005). In addition, innovation-related group processes are again considered as mediators of this relationship. To this end, expectations about effects of personality trait levels and team members' personality variability on knowledge worker teams' performance will be discussed in this section.

4.5.1 Hypotheses related to Big Five personality traits and Team Innovation

In this section, hypotheses with regards to the relationship between big five personality composition, innovation-related team processes and team innovative performance, is

presented. However, where the theoretical justifications are the same as in study 1, detailed explanations will not be given in order to avoid repetition.

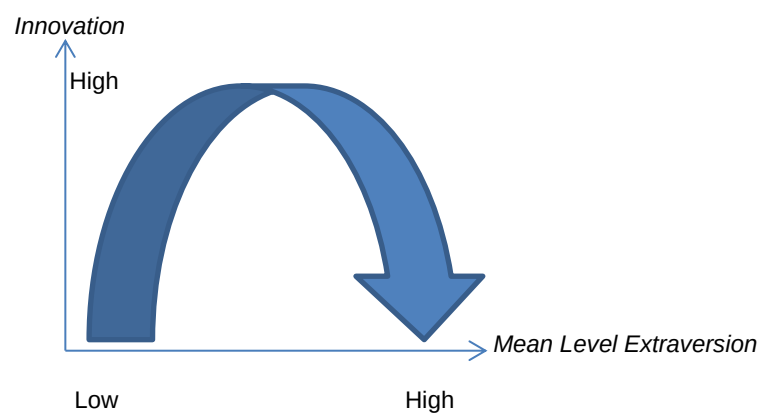
4.5.1.a) Extraversion:

In the literature, extroverts are defined as talkative, outgoing, assertive, adventurous and energetic (Costa and McCrae, 1992). Some researchers believe that these characteristic features may indeed have a positive impact on teamwork (Barry and Stewart, 1997). Extroverts are easy to talk with and can easily open conversations with the people around them. Therefore, they can indeed be helpful in terms of facilitating knowledge flow both inside and outside the team (Taggar, 2002). In their study, Barrick and Mount (1991) came up with supportive findings and argued that extroverts have a crucial impact in situations where a high level of interaction is needed. They are good at stimulating discussions and sharing knowledge within a group. Hence, it can be said that knowledge worker teams, where knowledge-sharing, internal and external communication, and networking is crucial, will also need extroverts to perform well. In addition to these findings, other researchers have argued that a high level of extraversion can also have a negative impact on teams' performance, as extroverts tend to be dominant, and this can create relationship conflicts that may harm innovative performance (Kichuk and Wiesner, 1998; Bechtold *et al.*, 2007). It has also been argued that being an extrovert and having a tendency for social interaction may distract the team's focus on task completion (Barry and Stewart, 1997; Mohammed and Angell, 2003). To this end, it is difficult to expect straight linear relationships based on these conflicting findings. Thus, a curvilinear relationship might be expected between extraversion and innovative performance (Peeters *et al.*, 2006). In fact, some scholars have also emphasised the mixed findings regarding the relationship between extraversion and team performance. In 1997, Barry and Stewart found a significant impact of curvilinear level extraversion on team performance. In light of theory and previous findings at the team level,

the positive impact of an intermediate level of extraversion on knowledge worker team innovation can be expected, whereas the association between high and low levels of extraversion is predicted to be negative. Therefore, the following hypotheses are proposed for this study:

H1a: The mean level of extraversion has a curvilinear ($\cap$ -shaped) relationship with knowledge worker team innovative performance, such that the highest performance will be at a moderate level of extraversion.

Figure 4-4 Expected Curvilinear Relationship Between Mean level of Extraversion and Creative Performance



Moving from a direct to a mediated relationship, the present study examines the relationship between mean levels of extraversion and KWT innovative performance, which is mediated by communication. As argued above, extroverts are perceived as, and found to be, facilitators of communication within teams (Taggar, 2002; Barrick *et al.*, 1991). Drawing from a theoretical basis and research findings, a linear relationship between extraversion and team communication might be predicted. However, in the present study, a curvilinear

relationship is expected between team communication and team innovative performance, as too much talk and a tendency to seek enjoyable social interactions at the expense of the task at hand may inhibit the teams' efficiency and task focus, particularly during complex tasks (Barry and Stewart, 1997; Mohammed and Angell, 2003). Hence, the main expectation is moderate propensity towards team extraversion, which will also lead to moderate mean levels of team communication and innovative performance.

H1b: The curvilinear relationship between mean-level extraversion and KWT innovative performance of a knowledge worker team is mediated by team communication, such that, the mean level of extraversion has a positive linear relationship with team communication, and team communication has a curvilinear (∩-shaped) relationship with knowledge worker team innovative performance.

Turning to moderated relationships between variability and mean level of extraversion and innovation, based on the findings presented above it can be argued that low and high mean levels of extraversion may not positively benefit team performance. As explained above, teams with low levels of extraversion are expected to suffer from reduced information exchange, whereas teams with high extraversion may result in too much talk with less task focus, as well as having excessive dominance within the team (Mohammed and Angell, 2003; Kichuk and Wiesner, 1998; Mazur, 1973). More to the point, having mean levels of extraversion, whether low or high, means that in either situation, any level of variability is not expected to have a significant impact on the relationship. Drawing on these arguments, a moderate level of extraversion within the team is predicted to be positively related to team innovation because, at this level, the expectation is a safe environment for participation with no harmful conflict and easy interaction among knowledge workers. In addition, I foresee

that if the relationship between moderate mean levels of extraversion and KWT innovation is moderated by a high variability in extraversion, this type of composition will create the most positive outcome. This is by way of saying that this research favours high variability in extraversion (including introvert and highly extrovert members together) (Barry and Stewart, 1997; Peeters *et al.*, 2006), because recent research shows the positive impacts of introverts in teams, and achieving harmony between both introverts and extroverts within the teams was found to be beneficial (Bradley and Hebert, 1997). To this end, a low variability in extraversion levels is not favoured in this research, as this type of team involves neither introvert nor highly extrovert members. Instead, the expectation is that teams that have members from all mean levels of extraversion (low, moderate and high) with moderate mean levels of extraversion anticipated to be most positively associated with innovation (Barry and Stewart, 1997; Neumann *et al.*, 1999). For instance, *Team B* (presented in red in the figure below) is representative of an expected team type in terms of both mean level and variability in extraversion.

H1c: The curvilinear relationship between mean levels of extraversion and innovative performance is moderated by variability in extraversion, such that the association between moderate mean level of extraversion and innovative performance is most positive when the variability in extraversion is high.

Figure 4.5: Variability in extraversion is moderating the relationship between mean level extraversion and team innovative performance

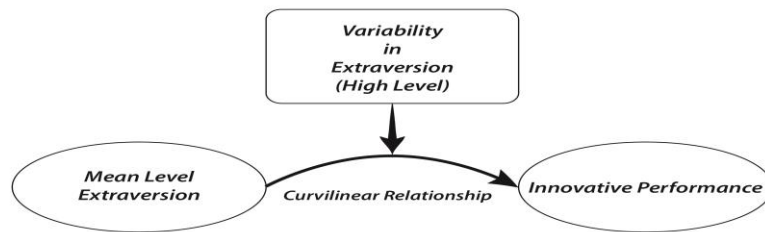


Figure 4.6: Team Types Based on Their Mean Levels and Variabilities in Extraversion

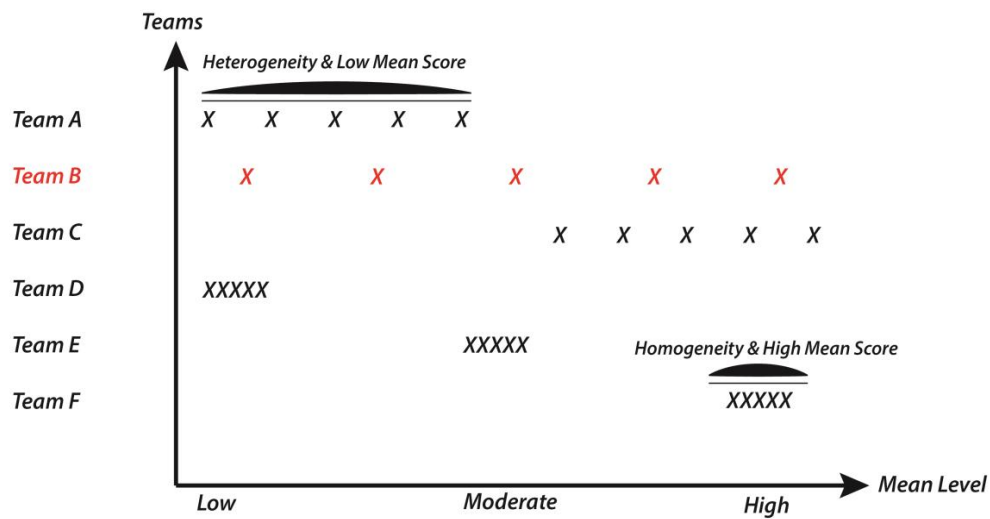


Table 4.3: Explanations of Performance Expectations of Team Types Based on the Mean and Variability Levels of Agreeableness

<u>Teams</u>	<u>Level</u>	<u>Variability</u>	<u>Creativity</u>	<u>Reason</u>
A	<i>Low</i>	<i>High</i>	<i>Low</i>	Low level of extraversion within the team jeopardises the information flow among members since there is no extrovert member to act as facilitator of formal and informal transaction. Strong variance among members is considered as beneficial however the average level of extraversion is low so the expectation is weak impact on the relationship between mean level of extraversion and innovation.
B-I	<i>Moderate</i>	<i>High</i>	<i>High</i>	This team is expected to be the best performer in terms of creativity because there will be an adequate level of communication and low dominance so no dysfunctional conflicts. Having a high level of variability within teams in terms of extraversion is also considered to be good in terms of the team being able to reach the right harmony for the innovation.
C	<i>High</i>	<i>High</i>	<i>Low</i>	High level of extraversion is also not favoured within the teams because extraversion comes with dominant characteristics and these can cause dysfunctional conflicts within teams. Additionally, in high level of extraversion situations of too much talk is expected and this may inhibit the team's focus on innovation. High variability is seen as positive, yet the average level of extraversion is high within the team - thus there won't be strong influence on the relationship between variability and innovation.
D	<i>Low</i>	<i>Low</i>	<i>Low</i>	The mean level of extraversion is low, and, variability is low, which is not seen as a promising situation for the innovative performance.
E	<i>Moderate</i>	<i>Low</i>	<i>Low</i>	Although the mean level is moderate, the team is highly homogeneous in terms of extraversion that is not a favourable situation for innovative performance.
F	<i>High</i>	<i>Low</i>	<i>Low</i>	In this team, once again the mean level is high and variability is low, hence innovative performance is expected to be low.

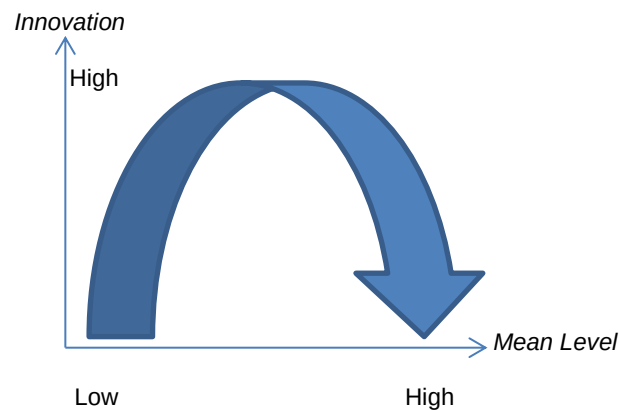
4.5.1.b) Agreeableness:

Agreeableness is used for people who are good-natured, flexible, cooperative and reliable. These people are good team players because they can easily work with other people and are open to different ideas (Mohammed and Angell, 2003; Peeters *et al.*, 2006; Vianen and De Dreu, 2001; Phillips and Loyd, 2006; Taggar, 2002). In the literature, agreeableness is often correlated with positive effects on team performance. It is argued that this personality trait can facilitate interpersonal attraction and interaction (Taggar, 2002). They are also good at solving conflicts smoothly (Barrick *et al.*, 1998; Neuman and Wright, 1999; Taggar, 2002). Thus, having some level of agreeableness will help knowledge worker teams to perform well because they are generally composed of members who have different types of expertise and backgrounds (Sapsed, 2002).

However, when innovation is the focus, evaluation in agreeableness might not be so preferable as it may result in a considerable level of conformity and may reduce critical evaluation of the decisions and actions of the group (De Dreu and West, 2001). Hence, teams with people who have significant levels of acceptive nature may struggle to engage in questioning and develop alternative approaches. Therefore, I expect curvilinear relationships between the mean level of agreeableness and KWT innovative performance.

H2a: The mean level of agreeableness has a curvilinear ($\cap$ -shaped) relationship with knowledge worker team innovative performance, such that the highest performance will be at moderate levels of agreeableness.

Figure 4-7 Expected Curvilinear Relationship Between Mean Level of Agreeableness and Innovative Performance



Moving on to the mediating relationships between mean level of agreeableness and KWT innovative performance, the findings show that having agreeable members in a team is good for the team's cohesion, wellbeing and safety (Barrick *et al.*, 1998). Thus, it can be predicted that agreeable members facilitate cohesion within work groups and, with a high level of agreeableness, may lead to high cohesion within teams. In other words, a linear relationship is likely to occur between mean level of agreeableness and team cohesion. Yet, high cohesion is often questioned when innovation is the matter at hand. (Sethi, Smith and Park, 2002). Highly cohesive groups often tend to overlook processing external developments. Furthermore, conformity among members can reach a point where decisions become irrational and painful in this type of group. This situation is called 'groupthink' in the literature (Turner and Pratkanis, 1998). In their study, Bechtoldt and his associates (2007) stressed this issue and stated that to be innovative, work groups should avoid being significantly cohesive and high levels of agreeableness within teams might cause groupthink. As a result, the expectation is that a moderate level of cohesion within the team will be most helpful towards innovative outcomes. Hence, the hypothetical prediction is a moderate level of

agreeableness will result in a moderate level of team cohesion, and this will lead to team innovation.

H2b: The curvilinear relationship between mean levels of agreeableness and KWT innovative performance is mediated by team cohesion, such that mean level of agreeableness has a positive linear relationship with team cohesion and team cohesion has a curvilinear relationship with knowledge worker team innovative performance.

Moreover, to be innovative, members need to develop constructive debates. Although agreeable members elicit and appreciate others' contributions, they fall short in contributing to work-related conflicts. They are, in fact, known as conflict solvers (Barrick *et al.*, 1998; Neuman and Wright, 1999; Taggar, 2002). Teams with high mean levels of agreeableness will have a supportive environment, yet innovation teams also need to have an atmosphere where there is some level of divergence in ideas and task conflict (De Dreu and West, 2001). On the other hand, teams with low mean levels of agreeableness may need to deal with disagreeableness and excessive amounts of conflict (Mohammed and Angell, 2003). Accordingly, too much task conflict can also be harmful towards team innovation because it may result in too much communication and information overload, as well as reducing the synergy and focus among knowledge workers. In fact, in a study conducted in 2006, it was found that task-related conflicts are, to some degree, beneficial for team innovation. In other words, too little or too much task conflict is detrimental to team innovation, and moderate levels of task conflict results in best performance (De Dreu, 2006). To this end, having a moderate mean level of agreeableness may relate to moderate task conflict, and this will result in team innovation.

H2c: The curvilinear relationship between mean levels of agreeableness and KWT innovative performance is mediated by task-related conflicts, such that mean levels of agreeableness has a negative linear relationship with task-related conflicts, and task-related conflicts, in turn, has a curvilinear relationship with KWT innovative performance.

Turning to the moderated relationship between variability in agreeableness, mean levels of agreeableness and innovative performance, with regards to mean levels, a moderate level of agreeableness will be the most beneficial for knowledge worker teams. When it comes to variability, as stated in study 1, having agreeable and less agreeable members within the team is good for the creation of new ideas and innovation because challenging the attempts of less agreeable members may lead to creative abrasion, which in turn may cause innovative ideas to flourish (Shari, 1998). Thus, once again, a high level of variability is favoured in this research. In contrast, low levels of variability in agreeableness are not supported. A low level of variability in agreeableness may create homogeneity, and high levels of cohesion and conformity, which are not promising antecedents to innovation (Sethi, Smith and Park, 2002). Considering the possible detrimental and weak impacts of low-level agreeableness, respectively, variability in high levels of agreeableness should benefit the team to a greater extent. To this end, the overall prediction is that the relationship with moderate mean level of agreeableness and KWT innovation will be moderated by a high variability in agreeableness.

The hypothesis is:

H2d: The curvilinear relationship between mean levels of agreeableness and KWT innovative performance is moderated by variability in agreeableness, such that the association between moderate mean levels of agreeableness and innovative performance is most positive when the variability in agreeableness is high.

Figure 4.8: Variability in agreeableness is moderating the relationship between mean level agreeableness and team innovative performance

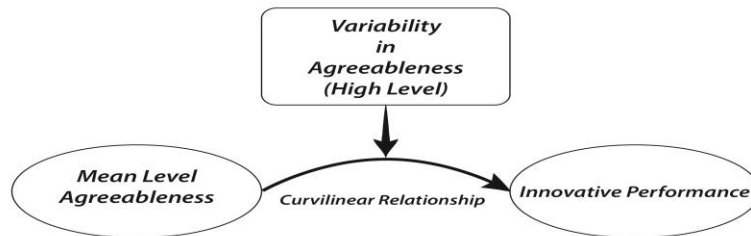


Figure 4.9: Team Types Based on Their Mean Levels and Variabilities in Agreeableness

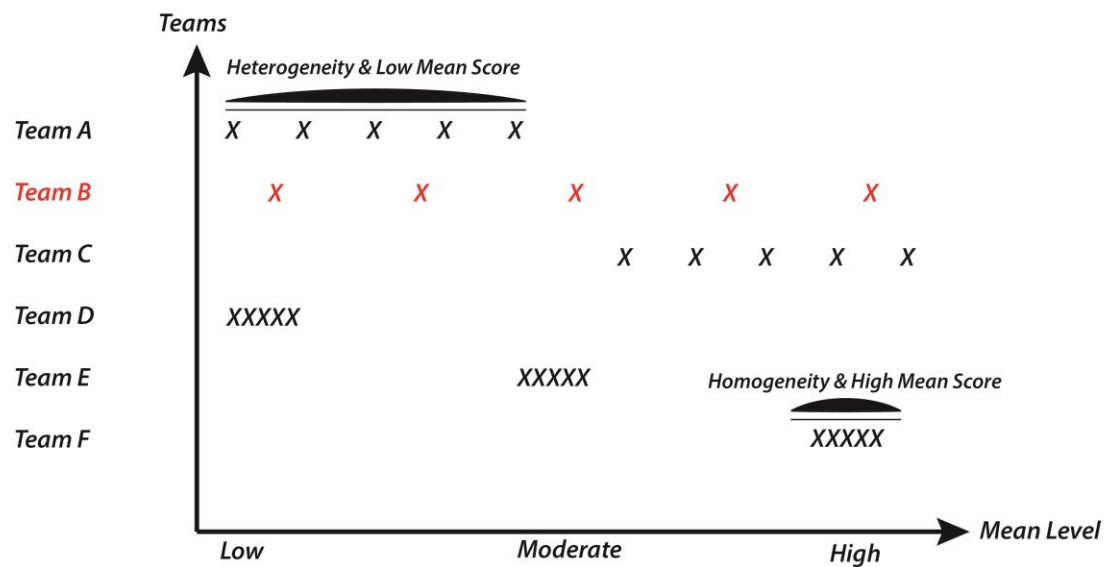


Table 4.4: Explanations of Performance Expectations of Team Types Based on the Mean and Variability Levels of Agreeableness

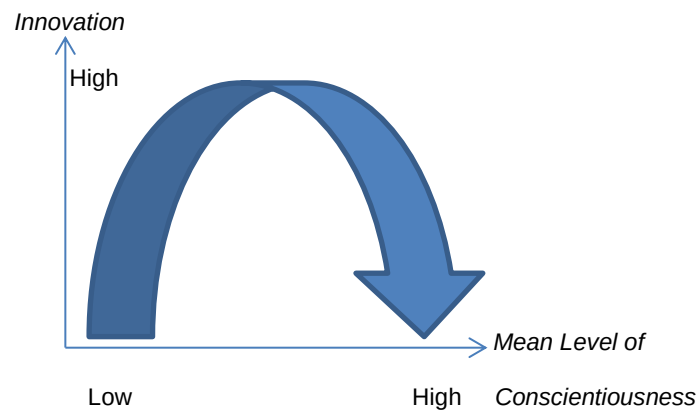
<u>Teams</u>	<u>Level</u>	<u>Variability</u>	<u>Creativity</u>	<u>Reason</u>
A	<i>Low (-)</i>	<i>High (+)</i>	<i>Low</i>	Low level of agreeableness within the team jeopardises the cooperation and knowledge-sharing among members since there will be no agreeable member who facilitates formation of trust among members as well as increasing the participative safety in the team. Strong variance among members is considered beneficial. However the average level of agreeableness is low so the expectation is a weak impact on the relationship between mean level of agreeableness and innovation.
B	Moderate (+)	High (+)	High	This team is predicted to be the best performer in terms of innovation because there will be adequate level of cooperation trust and constructive task-related conflicts within the team. High levels of variability within teams, in terms of agreeableness, is also considered as positive for the team to be able to reach the right harmony through having adequate levels of disagreeable/agreeable members for the innovative performance.
C	<i>High (-)</i>	<i>High (+)</i>	<i>Low</i>	A high level of agreeableness is not favoured within the teams because agreeableness comes with the confirmative and less conflict-oriented nature, and these characteristics can cause a dysfunctional level of cohesion groupthink and weak minority dissent in the team. As mentioned above, a high variability in agreeableness is seen as positive, yet if the average level of agreeableness is high within the team thus there won't be strong impact on innovation.
D	<i>Low (-)</i>	<i>Low (-)</i>	<i>Low</i>	The mean level of agreeableness is low and also variability is low which is not seen as a promising situation for the innovative performance.
E	<i>Moderate (+)</i>	<i>Low (-)</i>	<i>Low</i>	Although the mean level is moderate, the team is highly homogeneous in terms of agreeableness which is not a favourable situation for innovative performance.
F	<i>High (-)</i>	<i>Low (-)</i>	<i>Low</i>	In this team, once again the mean level is high and variability is low hence innovative performance is expected to be low.

4.5.1.c) Conscientiousness:

Conscientiousness refers to extent to which a person is responsible, careful, hardworking and self-disciplined. Conscientious people are intrinsically motivated and willing to overcome the obstacles they encounter. Stewart and Carson (1997) claim that these people work better in conditions where hierarchical control is low and autonomous working is high. Knowledge workers are self-disciplined and acknowledged experts. Hence, the characteristics and features of conscientious people are in line with the definition of knowledge workers, and therefore we can expect high conscientiousness levels for most knowledge workers (Newell *et al.*, 2009). Conscientiousness people are also known as individuals who have high levels of task cohesion and the ability to deal with complex tasks (Van Vianen and De Dreu, 2001; Schneider and Delaney, 1972). These functions are vital, particularly to the implementation stage of innovation. Studies conducted in team contexts found that conscientiousness is positively related to team performance (Barrick *et al.*, 1998; Kichuk, 1996). It should be noted that there are studies that have found a negative relationship between conscientiousness and creativity (Baer *et al.*, 2008; Robert and Cheung, 2010). However, when it comes to innovation, idea generation is the first step, whilst the final step of innovation involves implementation of the ideas generated by group members. Having been famous for being determined to finish the task in hand, I expect moderate mean levels of conscientiousness will be positively related to team innovative performance. Based on the findings discussed, I expect to find that:

H3a: The mean level of conscientiousness has a curvilinear ($\cap$ -shaped) relationship with knowledge worker team innovative performance, such that the highest performance will be at moderate level of conscientiousness.

Figure 4-10 Expected Curvilinear Relationship Between Mean Level of Conscientiousness and Creative Performance



The relationship between conscientiousness and KWT innovative performance can be explained through task focus. Taggar (2002) argues that teams can benefit from conscientious members as they can keep the team focused on the task, inspire group members and provide organisation. Researchers also expect effective cooperation (Molleman *et al.*, 2004) from these members. Having these types of characteristics, conscientious knowledge workers help teams to stay focused on team tasks and targets (Lepine, 2003, Taggar, 2002). To this end, linear relationships can be predicted between team processes and mean-level conscientiousness. However, having too high a conscientiousness level - so as to have too much focus on tasks - may lead to rigid thinking and tunnel vision within the team, such that members may disregard external developments or creative alternative views to innovative solutions. In fact, research also shows that high mean levels of conscientiousness might result in a myopic outlook and reduced creativity (Baer *et al.*, 2008; Robert and Cheung, 2010). Bringing arguments and findings together, moderate mean levels of conscientiousness can be expected to create the most positive innovative outcome, as low levels of conscientiousness may lead to a degree of social

'loafing' among members (Schippers, 2013), whilst high mean levels of conscientiousness might end up with rigid thinking and reduced creativity (Baer *et al.*, 2008). Hence, the prediction is that the association between moderate mean level conscientiousness and KWT innovative performance will be mediated by moderate levels of task focus within the team.

H3b: The curvilinear relationship between mean level of conscientiousness and KWT innovative performance is mediated by team task focus, such that a mean-level of conscientiousness has a positive linear relationship with task focus, and, in turn, task focus has a curvilinear relationship with innovative performance of knowledge worker teams.

Turning to moderating relationships, it might be expected that low levels of variability will moderate the relationship between moderate mean levels of conscientiousness and team innovative performance, as a high level of conscientiousness can inhibit creative performance, whilst conversely a low mean level of conscientiousness may lead to low task cohesion and motivation problems. Therefore, moderate mean levels are favoured. With regards to variability in conscientiousness, a low level of diversity is expected to create the most positive outcome, because high variability in conscientiousness may involve members with high social loafing tendencies and low task focus (Schippers, 2014). Having the complex task in hand, these features are likely to harm the teams' innovative performance; therefore, particularly in the implementation stage, teams may not tolerate low conscientiousness (Latane, Williams and Harkins, 1979). Therefore, a mean level of conscientiousness is likely to be crucial for innovative performance if this relationship is moderated by low levels of diversity in conscientiousness. Drawing on the arguments above, *Team E*, presented in red in the figure below, might be a good example of a team that has expected mean and variability levels.

H3c: The curvilinear relationship between mean level of conscientiousness and KWT innovative performance is moderated by variability in conscientiousness, such that the association between moderate mean level of conscientiousness and innovative performance is most positive when the variability in conscientiousness is low.

Figure 4.11: Variability in conscientiousness is moderating the relationship between mean level conscientiousness and team innovative performance

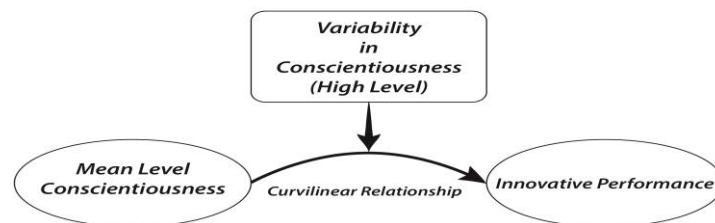


Figure 4.12 TeamTypes Based on Their Mean Levels and Variabilities in Conscientiousness



Table 4.5: Explanations of Performance Expectations of Team Types Based on the Mean and Variability Levels of Agreeableness

<u>Teams</u>	<u>Level</u>	<u>Variability</u>	<u>Creativity</u>	<u>Reason</u>
A	<i>Low (-)</i>	<i>High (+)</i>	<i>Low</i>	A low level of conscientiousness within the team may cause a reduction in the task cohesion and responsibility rates of the team, which is expected to have a negative impact on creativity. Since conscientious members are famous for achieving targets and being responsible for the task in hand, teams need a moderate level of conscientiousness. Strong variance in conscientiousness is considered beneficial. However in team A, the average level of conscientiousness is low so no matter how various the team is, the creative performance will be low.
B	<i>Moderate (+)</i>	<i>High (+)</i>	Low	Team B has moderate mean levels of conscientiousness which is predicted to be a promising situation in terms of innovation because there will be an adequate level of focus on the task and low level of rigid thinking and adherence to established ways of thinking and doing things. However, having a high level of diversity in conscientiousness within teams is not considered as good for the team being able to reach the right harmony for innovation since high levels of heterogeneous teams may involve members whose focus on the tasks in hand is poor and have social loafing tendencies
C	<i>High (-)</i>	<i>High (+)</i>	<i>Low</i>	A high level of conscientiousness is also not favoured within the teams because conscientiousness comes with rigid thinking and a tendency to act towards established way of doing things, and these type of features are not favoured when it comes to creativity. High variability is not seen as very positive. Additionally, the average level of conscientiousness is high within the team, thus there won't be strong influence on innovation.
D	<i>Low (-)</i>	<i>Low (-)</i>	<i>Low</i>	The mean level of conscientiousness is low and, which is not seen as being promising one for creative performance. In addition, when the average level of conscientiousness is low within the team thus the level of variability is not expected to have a strong influence on creativity.

E	Moderate (+)	Low (+)	High	Team E has a moderate mean level of conscientiousness and it is homogeneous in conscientiousness. This could be a favourable situation for innovative performance because conscientious members often help in task motivation, idea selection, and, in particular idea implementation. Therefore Team E can benefit from its moderately conscientious members while at the same time avoiding social loafing (low conscientiousness) and rigid thinking (high conscientiousness)
F	High (-)	Low (-)	Low	In this team once again, the mean level is high and variability is low, hence creativity performance is expected to be low.

4.5.1.d) Neuroticism:

The final dimension of personality is neuroticism. People who are high in neuroticism are defined as anxious, emotional, defensive and sometimes depressed (Mohammed and Angell, 2003; Peeters *et al.*, 2006; Vianen and De Dreu; 2001; Phillips and Loyd, 2006; Taggar, 2002). These emotionally unstable members are likely to disrupt the cohesiveness among other team members and cause conflicts (Peeters *et al.*, 2006). Therefore, safe climate, communication and support levels of knowledge worker teams are expected to be negatively affected by neurotic members. Hence, the expectation is that a low mean level of neuroticism will generate the most positive innovative outcome. The following hypothesis can be proposed for neuroticism:

H4a: The mean level of neuroticism has a negative relationship with KWT innovative performance, such that the highest performance will be at low mean level of neuroticism.

Turning to the mediating relationships, the relationship between mean-level neuroticism and KWT innovative performance is expected to be mediated by participative safety in a negative way. In other words, an increase in neuroticism within the team is predicted to negatively influence participative safety, which leads to lower innovative performance as the members

of a knowledge worker team need to be emotionally stable, focused and self-motivated to deal with complex and uncertain tasks. Having unstable and pessimistic members may inhibit creativity and safety within the team (Mohammed and Angell, 2003; Stewart *et al.*, 2005; Thoms, Moore and Scott, 1996). Accordingly, neurotic members are prone to question the decisions made since they are anxious about actions taken tend to feel unsure about the ideas created within the team (Van Vianen, De Dreu, 2001).

H4b: The relationship between mean level of neuroticism and KWT innovative performance is mediated by participative safety, such that a mean level of neuroticism has a negative linear relationship with participative safety, and, in turn, participative safety has a positive linear relationship with KWT innovative performance.

When it comes to the moderating relationship between mean levels of neuroticism and KWT innovative performance, which is moderated by variability in neuroticism, the research is mostly dominated by results with negative associations (Barrick *et al.*, 1998; Van Vianen and De Dreu, 2001). Nevertheless, based on theory and the large body of research that shows negative relationships between neuroticism and performance, a low level of variability is expected to be moderated by low mean levels of neuroticism for the most positive outcome. Low mean levels are predicted because the presence of emotionally stable members, particularly in highly challenging and complex contexts, is important for teams to remain cooperative and effective (Barrick *et al.*, 1998). In addition, it is argued that having one stable member (Molleman *et al.*, 2004) or just a few (Mohammed and Angell, 2003) unpredictable and neurotic members within the team is likely to have an adverse influence on the performance through distracting collaboration and the safety climate within the team (Van Vianen and De Dreu, 2001). Therefore, low levels of neuroticism (with regards to both

mean and variability aspects) is expected for the most positive performance of knowledge worker teams, for which *Team D* can be considered to be representative.

The hypothesis is:

H4c: The relationship between mean level of neuroticism and KWT innovative performance is moderated by variability in neuroticism, such that the association between low mean level of neuroticism and KWT innovative performance is most positive when the variability in neuroticism is low.

Figure 4.13: Variability in neuroticism is moderating the relationship between mean level neuroticism and team innovative performance

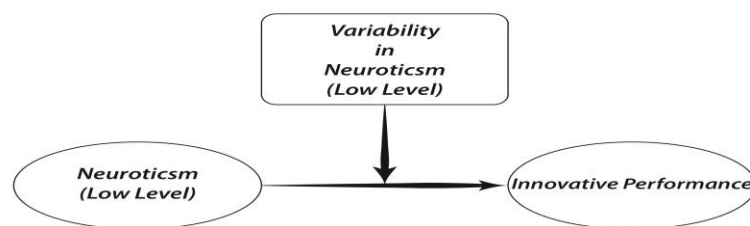


Figure 4.10: Team Types Based on Their Mean Levels and Variabilities in Neuroticism

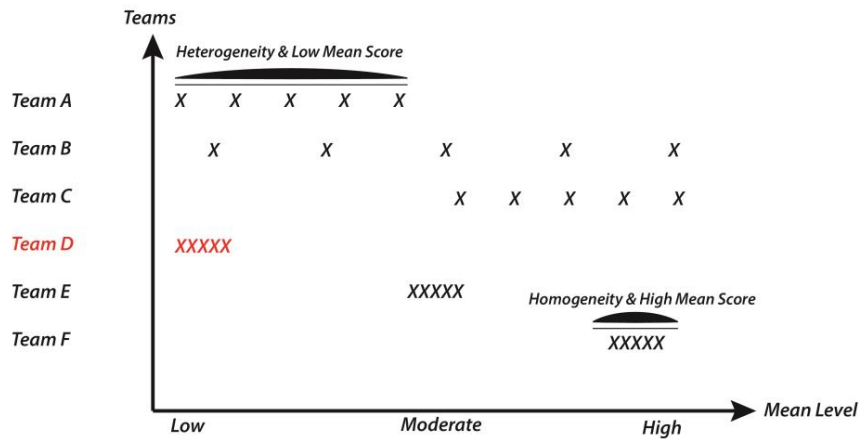


Table 4.6: Explanations of Performance Expectations of Team Types Based on the Mean and Variability Levels of Agreeableness

<u>Teams</u>	<u>Level</u>	<u>Variability</u>	<u>Creativity</u>	<u>Reason</u>
A	Low (+)	High (-)	Low	A low level of neuroticism within the team is considered beneficial for the team cooperation, effective knowledge-sharing and innovation. However, Team A loses the best performance due to having high levels of variability. Considering the negative influences of the neurotic members on team climate, interpersonal facilitation and innovation, low variety in neuroticism is expected creating more promising results in terms of innnovation.
B-1	Moderate (-)	High (-)	Low	As mentioned above high variability in neuroticism is not favoured for innovative performance of teams. Moving on to the moderate mean-level of neuroticism which refers to allowance of some level of neuroticism within teams. Considering the theory and research findings, even a moderate mean level of neuroticism is not favoured for team innovative performance.

C	<i>High (-)</i>	<i>High (-)</i>	<i>Low</i>	Based on the previous arguments, interaction of high mean level and high variety of neuroticism is predicted to generate negative results since groups like Team C composed of members who have a high tendency of neurotic behaviours which may result in dysfunctional reactions to situations and a neurotic atmosphere within the teams.
D	<i>Low (+)</i>	<i>Low (+)</i>	<i>High</i>	Team D is expected to be the best performing team type in terms of innovative performance because it has both low level of neuroticism and low level of homogeneity in neuroticism and each of these situations are most positively related with innovation.
E	<i>Moderate (-)</i>	<i>Low (+)</i>	<i>Low</i>	Although Team E has low level of variability in neuroticism, it has an average mean level of neuroticism all across the team which is likely to inhibit the innovative potential of the teams.
F	<i>High (-)</i>	<i>Low (+)</i>	<i>Low</i>	In this team, once again, the mean level of neuroticism is high and the impact of low heterogeneity in the team is expected to be low - hence innovative performance is expected to be low.

4.5.1.e) Openness to Experience:

People who are open to experience are intellectual, imaginative, broad-minded and curious. These kinds of people are tolerant of ambiguity and willing to experiment and try new things (Mohammed and Angell, 2003; Peeters *et al.*, 2006; Vianen and De Dreu; 2001; Phillips and Loyd, 2006; Taggar, 2002). Therefore, they are able to adapt easily to new conditions and the ability to search for and find alternative ways to solve problems can be expected from these members (LePine, 2003). Additionally, Homan and co-workers (2008) claimed that the members who are open to new experiences also foster knowledge-sharing through becoming more receptive. What is more, openness to experience is the most prominent trait with regards to its relationship with innovative outcomes (Hammond, Farr, Neff, Schwall &

Zhao, 2011; Shalley *et al*, 2004). To this end, I expect a linear relationship between mean-level openness to experience and KWT innovation.

H5a: The mean level of openness to experience has a positive relationship with KWT innovative performance such that, the highest performance will be at the high mean level of openness to experience.

When it comes to mediators, participative safety and support for innovation, team process variables are expected to mediate the relationship between mean levels of openness and innovative performance. People who are open to new experiences can encourage group members to forge a creative atmosphere, to learn new things, and to give support to new ideas (Taggar, 2002). Thus, one can argue that teams composed of open and receptive people are likely to feel safe to participate and ready to endorse innovation (Edmondson, 1999; West, 2012). In other words, the level of openness is potentially a leading factor for teams to be open to new and creative ideas, as well as supporting the novel paths leading to innovation.

The hypothesis is:

H5b: The relationship between mean level of openness to experience and KWT innovative performance is mediated by participative safety and support for innovation such that,

- mean level of openness to experience has a positive linear relationship with participative safety, and, in turn, participative safety has a positive linear relationship with innovative performance of KWTs*

- mean levels of openness to experience has a positive linear relationship with support for innovation and, in turn, support for innovation has a positive linear relationship with innovative performance*

The final hypothesis related to the big five is about moderating relationships between variability in openness to experience, mean levels of openness and innovative performance. One of the most important issues that motivates and unites knowledge workers in forming a team is the innovation and the challenge of the task itself. This helps knowledge workers to protect and strengthen their identity as complex and unique problem solvers or innovators. What is more, they are people who train themselves, develop their skills and add to their own knowledge with the aim of achieving complex and challenging tasks. Therefore, in a team situation with a novel task, normally every knowledge worker is expected to be curious, broad-minded and imaginative, with the aim of rising to the challenge of innovation. On the other hand, having members who are not enthusiastic to try new things will reduce motivation and the courage to follow unknown routes to innovation (Baer *et al.*, 2008). Therefore, teams that are homogenous and have high mean levels in terms of openness to experience in a knowledge intensive context can be negatively related to innovative performance. Based on these arguments *Team F*, shown in red in the figure below, are representative of a team which is expected to be open to experience levels.

H5c: The relationship between mean level of openness to experience and KWT innovative performance is moderated by variability in openness to experience, such that the association between high mean level of openness to experience and KWT innovative performance is most positive when the variability in openness to experience is low.

Figure 4.14: Variability in openness is moderating the relationship between mean level openness and team innovative performance

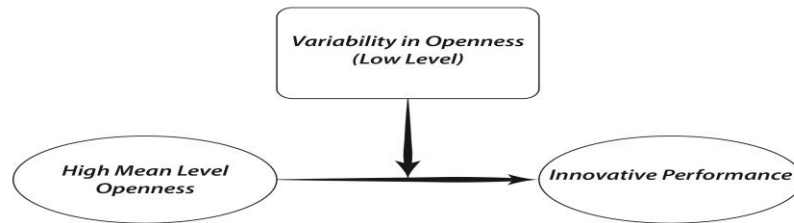


Figure 4.15: Team Types Based on Their Mean Levels and Variabilities in Openness

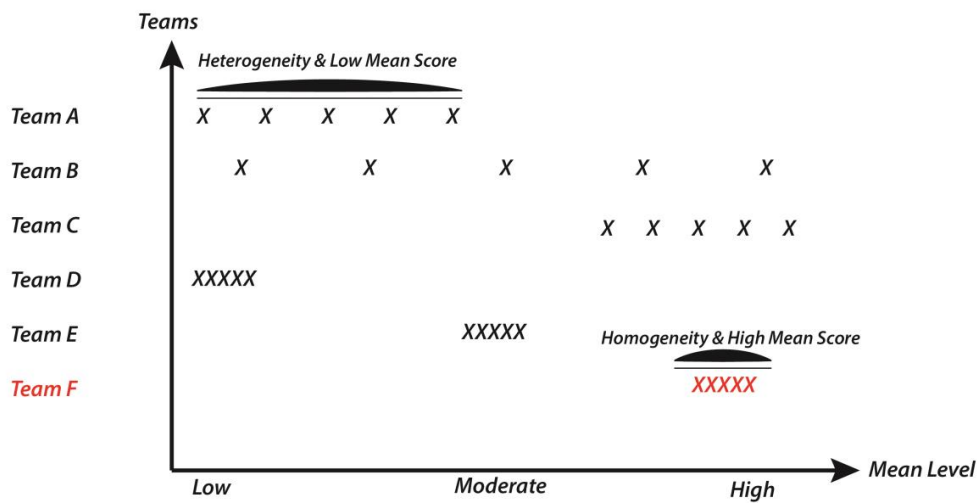


Table 4.7: Explanations of Performance Expectations of Team Types Based on the Mean and Variability Levels of Openness

<u>Teams</u>	<u>Level</u>	<u>Variability</u>	<u>Creativity</u>	<u>Reason</u>
A	<i>Low (-)</i>	<i>High (~)</i>	<i>Low</i>	A low level of openness to experience within the team reduces the acceptability of new ideas and idea sharing among members since there will be no open member who could facilitate the sharing and circulation of new ideas, as well as supporting them. Strong variance among members is also not considered beneficial because the expectation is a linear relationship between openness and team innovation. The more open members are in the team, the better their performance will be. Additionally, having a high level of variety will not have much impact on the relationship between mean level of extraversion and creativity as the average level of agreeableness is low across the team.
B	<i>Moderate (~)</i>	<i>High (~)</i>	<i>Moderate</i>	The prediction is a linear relationship between openness and innovation. Therefore a moderate level of openness may also have positive impact on the team but Team B is not the most preferred one when the target is innovation. A high level of variability within a team in terms of openness to experience is considered as negative for the team. The prediction, in fact, favours the homogeneity in openness.
C	<i>High (+)</i>	<i>High (-)</i>	<i>High (But not best)</i>	Although Team C has a high level of openness, the homogeneity level within the team is weak. Thus Team C is not likely to generate the most positive outcome.
D	<i>Low (-)</i>	<i>Low (+)</i>	<i>Low</i>	The mean level of openness is low and also variability is low which is not seen as promising situation for the innovative performance. As a matter of fact, having been deprived of open members, Team D may be the weakest team in terms of innovation.
E	<i>Moderate (~)</i>	<i>Low (+)</i>	<i>Low</i>	Although Team E is highly homogeneous in terms of openness to experience, its mean level is moderate. The moderate mean level of openness is not the preferred option for innovative performance when there is a possibility for composing teams that have high mean level and homogeneity in openness, as Team F.
F	High (+)	Low (+)	High	Team F is predicted to be the best performer in terms of innovation because it consists of members who are all highly open to new experiences. Considering the expected linear relationship between creative performance and both homogeneity in openness and mean level openness, this team is predicted to have the right composition in openness for innovation.

4.5.2 Dark Triad Personality Traits and Research Hypotheses for Study2

It has been claimed that personality plays an important role for individuals in gaining social status, securing their place within the group or increasing interactions with other people. For some people, being agreeable, conscientious or extrovert is the way to gain a place in society, while for others, arrogance, manipulation or aversive strategies help secure their status (O'boyle *et al.*, 2012; Jonason *et al.*, 2009). This section will explore the second type of personality traits (machievellianism, narcissism and psychopathy), which are more or less related to self-promotion, emotional coldness, duplicity, and aggressiveness (Paulhus and Williams, 2002).

4.5.2.a) Machievellianism:

The term 'Machievellianism' is generally used for people who have a manipulative characteristic. This characteristic was found by Christie and Geis (1970) after investigation of Machiavelli's own books (Furnham, Richard and Paulhus; 2013). Individuals who have this type of personality have a tendency to behave in a self-centered manner, and use deception and manipulation in their interactions with others (Jacobowitz and Egan, 2006; Jonason; Slomski and Partyka, 2011). It has been found that Machievellians often have a negative view of others, and a tendency to take ethically dubious decisions (Kish-Gephart, Harrison, and Trevino, 2010). According to O'Boyle and co-workers (2011), Machievellians have three main values. The first is the belief in effectiveness of manipulative strategies in their interpersonal relationships (e.g., you do not need to share the reasons for your actions if it doesn't suit you). The second value is related to cynicism (e.g., everyone has a motive to break the rules at some point if they find the right opportunity). Thirdly, Machievellians can sometimes behave in an immoral manner (it is good to find a shortcut even it does not match

with the rules). It can be inferred that the emotional intelligence of these people is low (Dahling, Whitaker and Levy; 2009). Jones and Paulhus (2009) also argue that although they have some tendency to behave in a manipulative or unethical way, Machiavellians do not behave in an extremely negative way.

In fact, these people should not be considered as loser actors in their social context, at least in the short run. Research shows some interesting findings about Machiavellians. Their peers perceive Machiavellians as smart and charming (Cherulnik, Way, Amesand and Hutto, 1981).

Hurley (2005) argued that Machiavellians can conform with others' behaviour, whilst at the same time manipulate any given situation to their own benefit. Additionally, Kessler and co-workers (2010) claimed that Machiavellians behave generously in public to manifest themselves in the best way possible. These skills may help Machiavellians to have social networks and increase job performance (O'Boyle *et al.*, 2012). However, it is not guaranteed that Machiavellians can always manipulate the situation. This factor may result in risky situations for them because other co-workers and teammates ultimately figure out the real intent, and the self-centred aims, of Machiavellians. This may harm the interpersonal dynamics in the workplace and be noted by others. Furthermore, the trust level that Machiavellians gained from others can decrease dramatically (Molm, 2010; O'Boyle *et al.*, 2012). Research findings are in furtherance of these arguments. In their study in 1989, Jaffe, Nebenzahl and Gotesdyner found negative relationships between Machiavellianism and team success. Bringing all these arguments and findings together, the prediction about mean levels of Machiavellianism and KWT innovative performance is given below.

H6a: The mean level of Machiavellianism has a negative association with innovative performance, such that the lowest performance will be at high mean level of Machiavellianism.

When it comes to the mediating role of team processes, relationship conflict is predicted as a mediator variable of the association between mean levels of Machiavellianism and KWT innovative performance. The first argument is about task focus. The political and manipulative tendencies of Machiavellians may cause a decline in their attention towards responsibilities of their job. In fact, Zetler and co-workers (2011) found a negative association between Machiavellianism and team commitment. In addition, other scholars have found that, coupled with unproductive work attitudes (Dahling *et al.*, 2009), Machiavellians are less likely to share their knowledge (Liu, 2008). Based on the arguments and findings above, considerable mean levels of Machiavellianism, including manipulative and deceptive attributes, may harm the connections among members and cause relationship conflicts, which may possibly lead to team member dissatisfaction (Wisse and Sleebos, 2016). Moreover, in light of the findings and theoretical underpinnings, it can be argued that, particularly in team situations where knowledge work occurs, trust and intensive interactions are prerequisites for effective innovative performance; high-level Machiavellianism may lead to a potential decrease in innovative job performance. Drawing on the arguments and findings presented, the hypothesis will be:

H6b: The relationship between mean level of Machiavellianism and KWT innovative performance is mediated by relationship conflict. Such that;

- mean level of Machiavellianism has a positive linear association with relationship conflict and in turn relationship conflict has a negative linear association with KWT innovative performance

Turning to the relationship between mean levels of Machiavellianism and team performance that is moderated by variability in Machiavellianism, owing to the manipulative and selfish tendencies of Machiavellianism, the expectation with regards to evaluation of mean levels Machiavellianism on KWT innovative performance is negative (Molm, 2010; O'Boyle *et al.*, 2012). Drawing from this argument, teams with low mean levels of Machiavellianism may be less likely to encounter problems that are created by Machiavellian members. In contrast, teams with moderate mean levels of Machiavellianism may still have relationship conflict and/or problems related to low cohesion. However, the most negative outcome is expected in teams that indicate high mean levels of Machiavellianism (Jaffe *et al.*, 1989). Additionally, when it comes to variability, low levels of variability with high mean levels are expected to be negatively associated with KWT innovative performance. Since, in this situation of high variability of Machiavellianism, teams may still have Machiavellianist members, yet in homogenous teams, the number of these individuals and their negative impact will be greater than in other circumstances (Zetler *et al.*, 2011; Jaffe *et al.*, 1989). As a result, I predict that teams that are composed of homogenous members whose mean levels of Machiavellianism is high, will have low innovative performance. *Team F* is an example of this, as shown in red in the figure below.

H6c: The relationship between mean level of Machiavellianism and KWT innovative performance is moderated by variability in machiavellianism, such that the association between high mean level of Machiavellianism and KWT innovative performance is most negative when the variability in Machiavellianism is low.

Figure 4.16: Variability in Machiavellianism is moderating the relationship between mean level Machiavellianism and team innovative performance

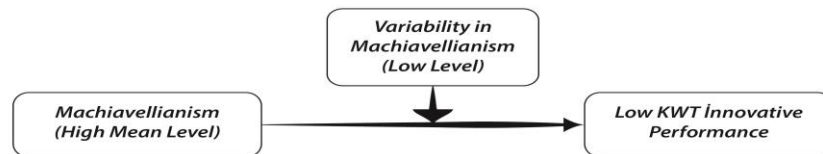
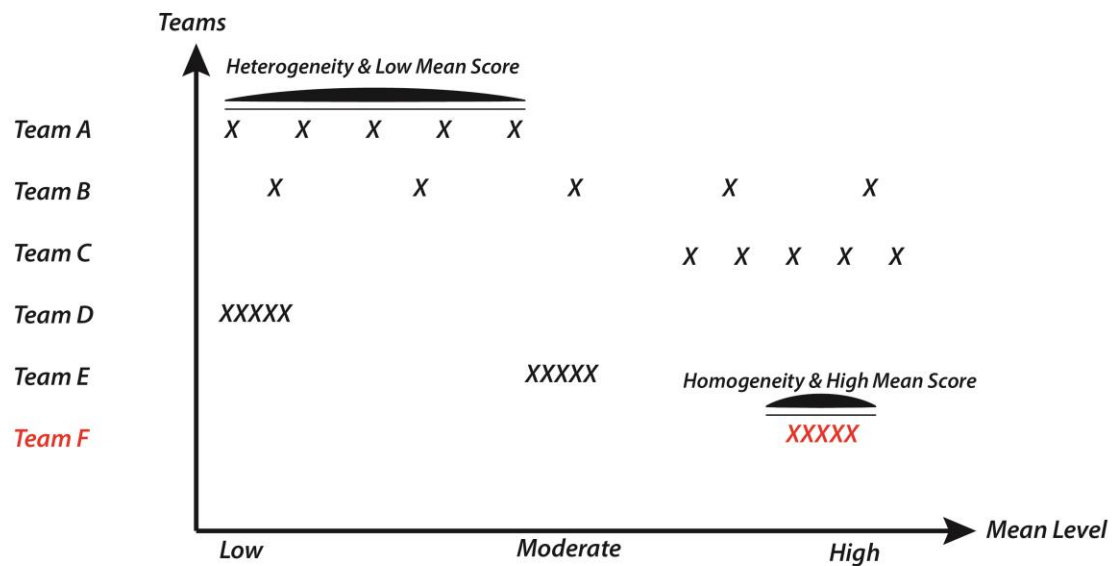


Figure 4.17: Team Types Based on Their Mean Levels and Variabilities in Machiavellianism



4.5.2.b) Narcissism:

Narcissists are the people who love self-praise and growth (Jonason *et al.*, 2011). These people see themselves as extraordinary, and more capable than others. They are good at overestimating their creativity, intelligence, success and capabilities (e.g., performance, leadership, academic, etc.) even though others do not agree with them (Nevicka, Ten velden, De Hoogh and Van Vianen. 2011). The main characteristics of Narcissists are being arrogant, autocratic, egocentric, dominant and exploitative in their interpersonal interactions (Paulhus, 1998; Jacobowitz and Egan, 2006). Therefore, they tend to seek attention and respect from others, and like to perform better than others (O'boyle *et al.*, 2012). They also do not like being criticised by others, and carry on good relationships with people who seem to admire them (Campbell, 1999).

On the other hand, these negative characteristics do not necessarily generate unwanted results. Indeed, research shows that others generally perceive narcissistic individuals as leaders in specific contexts (Judge, Ilies, Bono and Gerhardt, 2002), and the outcome of having a narcissist leader can sometimes be positive. For instance, it is argued that narcissistic leaders are good for chaotic and complex situations; therefore, this type is encountered more in modern organisations. Conversely, they are not effective in more stable environments (Campbell, Hofmann, Campbell and Marchisio, 2011)

However, within the team context, with these unfavourable characteristics, the benefit of narcissist members is likely to be outweighed by their potential for harm. In fact, scholars have found that narcissistic individuals tend to take credit from other individuals close to them, and this can create harmful results for both relationship development and job performance. Therefore, they may not perform well in tasks that require high levels of interpersonal relationships (Campbell *et al.*, 2000). Moreover, in terms of job performance,

research shows individuals with low narcissistic tendencies often perform better than narcissistic ones (Gabriel *et al.*, 1994; John and Robbins; 1994).

H7a: The mean level of narcissism has a negative association with KWT innovative performance, such that the lowest performance will be at high mean level of narcissism.

Moving on to the association with team processes, participative safety and relationship conflict are expected to mediate the relationship between mean level of narcissism and KWT innovative performance. Particularly within the team context, it has been found that if there is no high self-enhancement opportunity, narcissistic individuals are prone to social loafing. What is more, with their self-absorptive and egocentric characteristics, it has been revealed that they are exploitative in their relationships (Milon and Davis, 1996, cited in Jakopwitz and Egan, 2005), reluctant to share information and keep critical knowledge to themselves (Nevicka *et al.*, 2011). Therefore, the presence of these members may harm the participative safety climate within teams (Kayes, 2004). Having high levels of self-approbation, hyper-competitiveness and elitism may result in some counteractive behaviour from others, and clashes within the team. For instance, in group work, narcissistic members may be excluded by other members in terms of both formal and informal interactions (O'Boyle, 2012). Building on this, this type of worker may cause team member dissatisfaction and unsatisfactory group work (Soyer, Rovenpor, Kopelman, Mullins, and Watson, 2001). In light of foregoing findings and discussions, another prediction might be made about the positive association between narcissism and relationship conflict within teams. Given the predictions about the influence of narcissism on related team processes so far, it can be hypothesised that:

H7b: The relationship between mean level of narcissism and KWT innovative performance is mediated by participative safety and relationship conflict. Such that;

-mean level of narcissism has a negative linear association with participative safety and, in turn, participative safety has a positive linear association with KWT innovative performance.

-mean level of narcissism has a positive association with relationship conflict and, in turn, relationship conflict has a negative linear association with KWT innovative performance.

Moving on to the moderating relationship between variability in narcissism, mean levels of narcissism and KWT innovative performance, it can be argued that in comparison with low and moderate mean levels of narcissism, high mean levels of narcissism are expected to create the most negative outcome for knowledge worker teams because a narcissistic personality comes with attitudes that may cause relationship conflicts, and low communication and cohesion levels (Campell, Bush, Brunnel, and Shelton, 2005). In fact, research has also found negative associations between narcissism and team performance (Resick, Whitman, Weingarde, and Hiles, 2009; Campell *et al.*, 2000). Drawing on these arguments, the homogeneity of highly narcissistic members is expected to create the most negative innovative performance (Campell *et al.*, 2000). It can be argued that teams with high or moderate variability in narcissism may still involve narcissist members, yet these teams may be less negatively associated with narcissism compared to teams with low variability and high mean levels of narcissism, since, in the latter situation, the number – and so the negative influence – of narcissists is likely to be higher. *Team F*, as shown in the figure, could be good example of the team type most in accord with the arguments above.

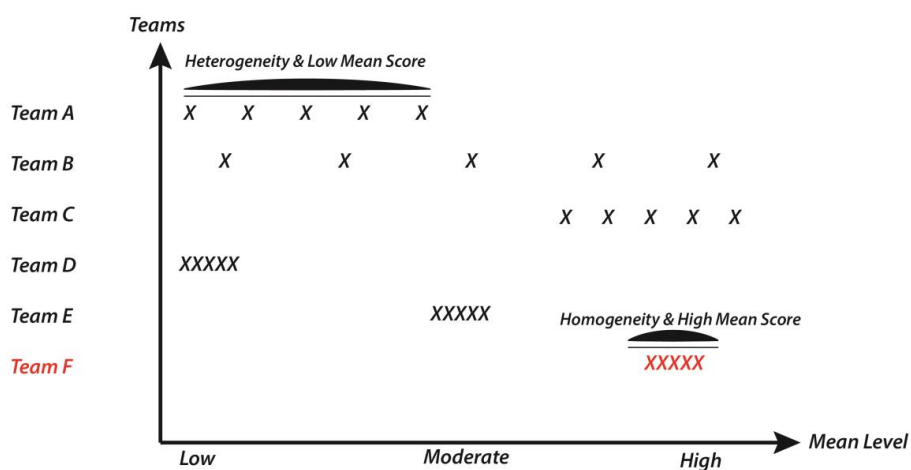
H7c: The relationship between mean level of narcissism and KWT innovative performance is moderated by variability in narcissism, such that the association between high mean level of

narcissism and KWT innovative performance is most negative when the variability in narcissism is low.

Figure 4.18 Variability in narcissism is moderating the relationship between mean level narcissism and team innovative performance



Figure 4.19 Team Types Based on Their Mean Levels and Variabilities in Narcissism



4.4.2.c) Psychopathy:

The last characteristic of the “dark triad” model is psychopathy, which refers to an individual who is selfish, careless in interpersonal relationships, and has a charming and impulsive personality (Jacobowitz and Egan, 2006). Hare and Neumann (2009) argued that these people tend to be charismatic and glib, as well as poor in terms of establishing empathy. They further argued that people high in psychopathy tend to engage in criminal actions to fulfil their needs or aims.

Scholars have argued that at least three million employees and employers could score high in psychopathy (Babiak, Neumann and Hare, 2010). These types of workers can perform in rational, less emotional situations. However, as mentioned above, they are likely to cause harmful work behaviour and, as with narcissism, relationship-oriented tasks are not for these individuals. The expected respect level from these individuals is low, and these people are likely to engage in illegal activities and aggressive behaviour (Hare and Neumann, O’boyle *et al.*, 2012). Therefore, in group situations, it is difficult to expect productive results from these individuals (Premuzic, 2015).

H8a: The mean level of psychopathy has a negative association with KWT innovative performance such that the lowest performance will be at high mean level of psychopathy.

Moving on to the association of mean level psychopathy with mediating team processes and innovative performance, the expectation is towards a negative influence on participative safety, and a positive influence on relationship conflict. Since being inclined to be arrogant, deceitful and impulsive, one cannot maintain healthy relationships with other members of the team in normal circumstances. In effect, in a study that investigates interpersonal

perceptions, it was revealed that psychopathic individuals were perceived negatively and less well liked (Rauthmann, 2012), and thus development of a participative and healthy climate in a team with such negative perceptions is not predicted to take place. Moreover, Baysinger, Lebreton and Scherer (2013) found that groups with high levels of psychopathy are prone to engage in malfunctioned interactions. As a result, individuals with psychopathic characteristics can potentially have a negative impact on participative safety within the group, as other group members may find it difficult to talk freely and engage in constructive discussions with people showing an arrogant and irresponsible nature. Pushing this argument further, another prediction concerns relationship conflicts within teams that have psychopathic members. Behaving irresponsibly and deceitfully may result in personal clashes amongst members that may also have a negative influence on the innovative performance of knowledge worker teams. Thus the hypotheses related to mediating variables will be:

H8b: The relationship between mean level of psychopathy and KWT innovative performance is mediated by participative safety and relationship conflict. Such that;

- mean level of psychopathy has a negative linear association with participative safety and, in turn, participative safety has a positive linear association with KWT innovative performance

- mean level of psychopathy has a positive linear association with relationship conflict and, in turn relationship conflict has a negative linear association with KWT innovative performance

Turning to the moderated relationship, the expectation is a low level of variability (homogeneity) and high mean levels of psychopathy creating the most negative outcome in terms of innovation. Having potentially disastrous attitudes of psychopaths in hand, high

mean levels of psychopathy in teams is likely to create a considerable number of problems, not to mention how this level is expected to be more strongly related with negative outcomes compared to low and moderate levels of psychopathy (Spain, Harms and Lebreton, 2013; Jonason *et al.*, 2012). Indeed, in their study, O'Neill and Allen (2014) found a strong negative relationship between psychopathy and team performance since teams with low mean levels of psychopathy are the ones that do not include psychopaths, and this help teams avoid the problems that can be created by psychopathic members. In addition, teams with moderate mean levels of psychopathy may still have problematic issues, particularly problems related with relationship conflict and team cohesion, yet this mean level is still expected to create less negative outcomes in comparison with teams that have high mean levels of psychopathy (Baysinger *et al.*, 2013). When it comes to variability, low levels of variability are predicted to be related most to negative outcomes. Teams that have homogeneity in members, all of whom have high mean levels of psychopathy, are the ones that involve more problematic members than others (i.e., teams that have moderate and high variability in psychopathy). To put it another way, although teams that have moderate and high variability in psychopathy may involve psychopathic members and may encounter the aforementioned team problems, these configurations are expected to have a less negative influence than teams that are homogenous in psychopathy (O'Neill and Allen, 2014). Bringing all these arguments together, teams that are homogenous and have high mean levels of psychopathy are expected to show the least innovative outcome. Once again, *Team F*, shown in red in the figure below, is expected to be most representative of this type.

H8c: The relationship between mean level of psychopathy and KWT innovative performance is moderated by variability in psychopathy, such that the association between

high mean level of psychopathy and KWT innovative performance is most negative when the variability in psychopathy is low.

Figure 4.20 Variability in psychopathy is moderating the relationship between mean level psychopathy and team innovative performance

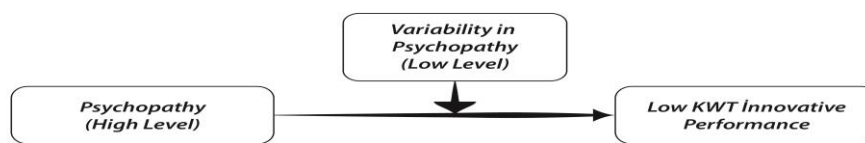


Figure 4.21: Team Types Based on Their Mean Levels and Variabilities in Psychopathy

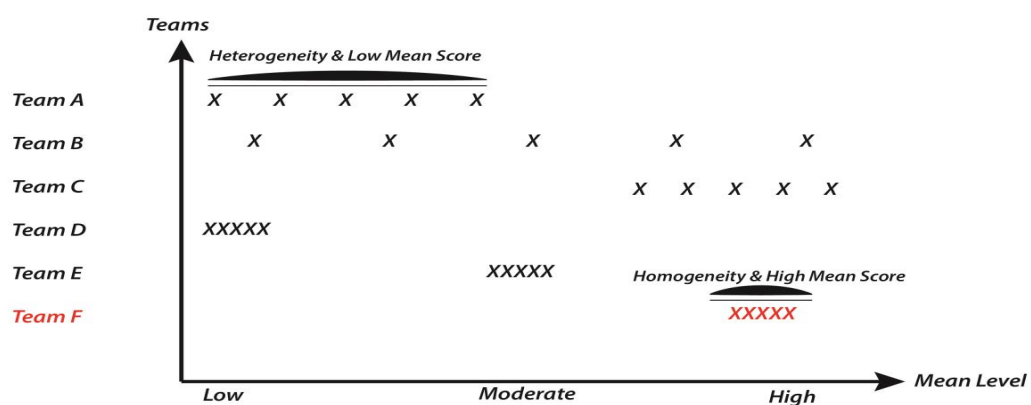
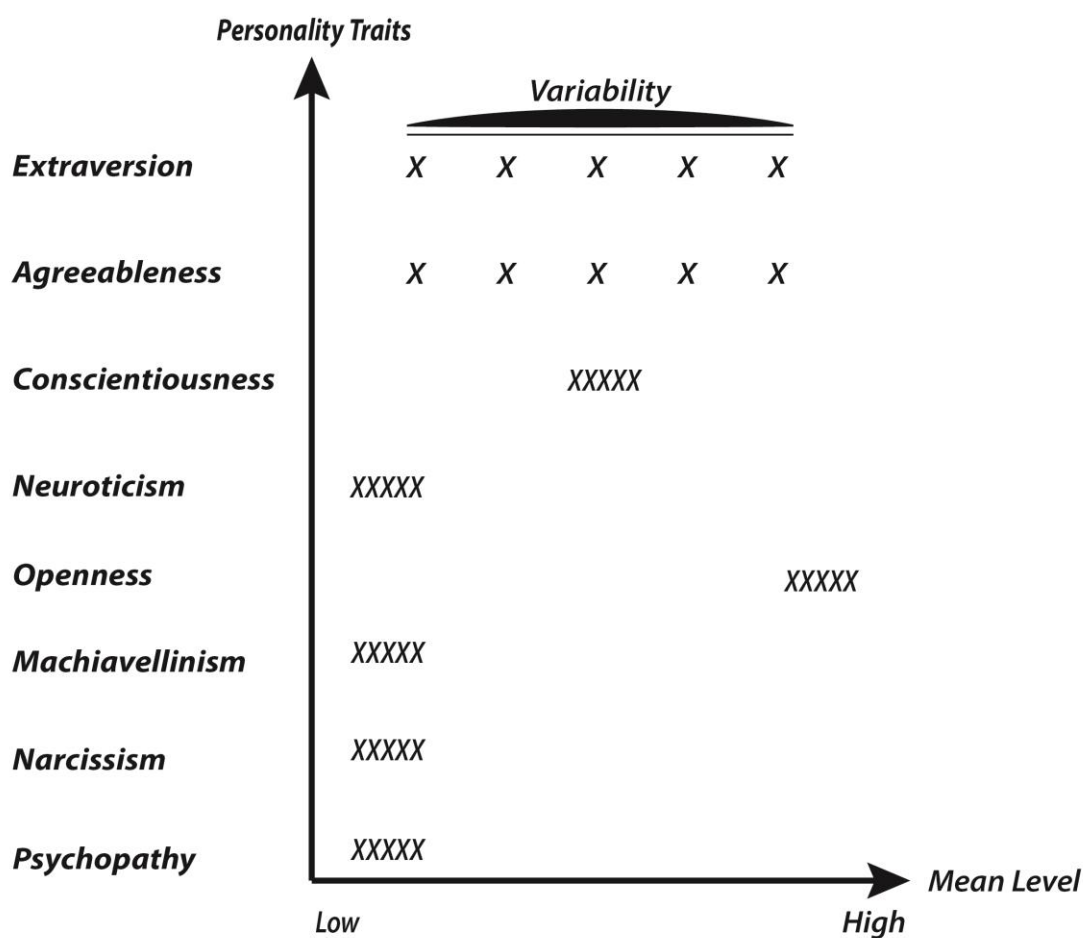


Figure 4.22 Summary Figure of Expected Personality Composition within teams

Extraversion	➔	Moderate mean level + High Variability
Agreeableness	➔	Moderate mean level + High Variability
Conscientiousness	➔	Moderate mean level + Low Variability
Neuroticism	➔	Low mean level + Low Variability
Openness	➔	High mean level + Low Variability
Machiavellinism	➔	Low mean level + Low Variability
Narcissism	➔	Low mean level + Low Variability
Psychopathy	➔	Low mean level + Low Variability



X = Indicates a team member

Table 4.8: Summary of Proposed Relationships Between Personality Types and Team Processes

<u>FRAMEWORKS</u>	<u>PERSONALITY TYPES</u>	<u>CHARACTERISTICS</u>	<u>RELATED TEAM PROCESSES</u>
BIG FIVE PERSONALITY TRAITS	<i>Extraversion</i>	Talkative Assertive Adventurous Energetic	Team Communication (+)
	<i>Agreeableness</i>	Good-Natured Flexible Cooperative Reliable	Team Cohesion (+) Task Related Conflict (+)
	<i>Conscientiousness</i>	Careful Hardworking Planful	Task Focus (+)
	<i>Neuroticism</i>	Anxious Emotional Defensive Depressed	Participative Safety (-)
	<i>Openness to Experience</i>	Intellectual Imaginative Broad-Minded Curious	Participative Safety (+) Support for Innovation (+)
DARK TRIAD PERSONALITY TRAITS	<i>Machiavellianism</i>	Manipulative Self-Interested Deceptive	Team Cohesion (-) Relationship Conflict (+) Task Focus (-)
	<i>Narcissism</i>	Selfish Egocentric Attention seeker	Participative Safety (-) Team Communication (-) Team Cohesion (-) Relationship Conflict (+)
	<i>Psychopathy</i>	Arrogant Deceitful Impulsive Irresponsible	Participative Safety (-) Team Communication (-) Team Cohesion (-) Relationship Conflict (+)

4.6. METHODS

In this section of study 2, the first part is allocated to information about research samples and data collection. Following this, the statistical data which includes the exploratory factor analysis results for each scales, the reliability rates and the correlation scores of each variable will be presented.

This study was designed with the aim of understanding the relationship between big five and dark triad personality characteristics, innovation-related group processes and innovative performance of knowledge worker teams. The present study is quantitative in nature and it was conducted as a survey research. Accordingly, questionnaires were used to measure personalities and quantitative methods assisted me to test the developed hypotheses regarding the relationship between the factors.

4.6.1 Research Sample and Data Collection

The data was collected through self-completion paper and pencil questionnaires. The questionnaires were delivered to team members by me or supervisors of each team. More information will be given about this process in the following parts. The research was conducted in 13 knowledge-intensive research and development organisations and in 4 R&D departments of technology-related firms operating in Turkey. These firms and departments mainly operate in R&D in areas such as information and communication technologies, and electronics (Gumusluoglu, Aygun and Hirst, 2013). Existing contacts were used for data collection. Additionally, new contacts were also developed through continuing access. Accordingly, the contact details of the key employees in other organisations who may

provide access were reached through using networks of organisations in the existing contact list.

The sample covers 53 knowledge worker teams including 292 individual participants, so that it can be comparable to other studies conducted in this research area. All samples will consist of knowledge worker teams. The age of the individual participants for this study ranged from 19 to 56. The sample included 225 (77%) male, and 67 (23%) female volunteers.

Data collection process started with senior managers. They were contacted and interviewed to determine the teams and their members who could participate in this research. After these processes, team members were invited to participate. The aim of the research was explained to the participants and I guaranteed to protect the participants' anonymity and privacy rights. In order to identify which team is which, I coded each team involved in this study. After that, and before delivering the questionnaires, I coded each questionnaire in accordance with the code given to each team. Therefore, all participants in one particular team received a questionnaire that had already been identified with the same code. Since every member within the team received a questionnaire with the same code, it is not possible to identify the individuals. Additionally, some companies preferred the delivery of the questionnaires to be done through a selected supervisor from the company rather than the researcher, in which cases I provided individually sealed envelopes with the documents enclosed. The supervisors were informed that the participants' involvement in the study was voluntary and there was no obligation for participation. This voluntariness was also mentioned in the participant information sheets. On the other hand, a few firms required online delivery of questionnaires. In this situation, the e-mail addresses of the team

members, who accepted participation, were obtained from the firm and online questionnaires were sent to these participants for completion.

Team innovative performance assessments were done by external assessors (supervisors, managers etc.), and there was one assessor per team. Therefore, the researcher visited or contacted the firms after some time (more than one month later) to acquire from assessors the completed innovative performance assessment questionnaires.

4.6.2 Questionnaire Development

The questionnaire developed for study 2 involved the scales of variables that are included in the extended input-process-output model. Each scale was used for measurement of the variables in the model, and all the scales in the questionnaire are original and validated scales by previous studies. The 5-point Likert scale was used for all the scales included in the questionnaire and the Likert scale was ranged from 'strongly disagree' to 'strongly agree'.

All of the scales involved in the questionnaire are originally designed in English. Since the present study was administrated in Turkey, the measures were translated from English to Turkish in order to collect the data effectively and obtain reliable data. The translated version of the questionnaire was controlled by one of my colleagues by comparing both the English and Turkish versions of the questionnaire. Additionally, translated scales were also compared against previously translated versions of the same scales used in research. Then, a Turkish speaking colleague, who is aware of the research aim and the subject, controlled the Turkish version of the questionnaire and my two colleagues and I were involved in the translation process to finally evaluate, discuss, and compromise on the questionnaire that was used in study 2.

4.6.3 Measurement of Personality, Team Processes and Innovative Performance of Knowledge Worker Teams

This part will introduce the measurement types that were used in this study to measure personality (input), team processes (process) and output variables (team innovative performance).

As mentioned in study one, both studies embrace the team input-process-output approach to conceptualise relationships of particular variables in teamwork context. The focus of the first study was on the relationship between personality composition and creative performance of student teams. Moving on to the present study, the relationship between personality traits (this time both big five and dark triad), team processes and innovative performance is under investigation. Therefore, the IPO model of team innovation is also considered as appropriate for this research for the aim of understanding this complex relationship between the variables (West and Anderson, 1996). However, to test the predicting processes of team innovation and their roles as mediators in the model, the expanded version of the team innovation model will be applied in the present study (Hulsheger, Anderson and Salgado, 2009).

4.5.2.a) Measures

The measures used for study 2 are included in the extended IPO model that conceptualises the main focus of study 2. These measures are endorsed in order to understand the impact of personality composition on knowledge worker team performance through innovation-related team processes. All of these measurements are crucial for discovering the determinants of team-based innovation in knowledge intensive context. Data collected

through questionnaires, and the Likert scale was used for all measures which ranged from “totally disagree” to “totally agree”. Each of these variables are explained in sections 3-4 and summarised in the extended IPO model of Innovation 1 and 2.

Measures of Input (Personality) Components:

Big Five Personality Traits: As a widely used and suggested big five personality measurement instrument, “Big Five Personality Inventory” was used for this study as BFI is a brief, and comprehensive measure of the five domains of personality (John and Martinez, 1988; Joh and Srivastava, 1999). This measurement is comprised of agreeableness, extraversion, conscientiousness, openness to experience and neuroticism scales that are composed of 44 items in total. These measurements are the same ones that are used in the study 1 and explained in that part in a detailed way.

Dark Triad Personality Traits:

26-item Dark Triad Personality Inventory SD3. was used for the measurement of Machiavellian, narcissistic and psychopathic personality traits (Jones and Paulhus, 2014). The dark triad personality scales, which are included in the dark triad measurement, are original and previously used measures (Maples, Lankin and Miller, 2014). In addition, Likert scale that consists of 5 points was used to measure these personality traits that ranged from ‘strongly disagree’ to ‘strongly agree’.

Machiavellianism: The measure of the Machiavellianism personality investigates the manipulative tendencies of the team members. In other words, it focusses on the level of the manipulative manner of individuals. The scale consists of 5 items. Example of items used in this measure: “most people can be manipulated” and “it is wise to keep track of information that you can use against people later”.

Narcissism: The second measurement factor of the dark triad focuses on egoistic dispositions, thus the aim is to evaluate the narcissistic (self-involved) levels of the teams. There were 5 items within the narcissism scale. Some examples of items from the scale are; “I know that I am special because everyone is telling so” and “Many group activities tend to be dull without me”.

Psychopathy: The third dimension of dark personality is related to careless and selfish inclinations among team members. This measure also focuses on the level of psychopathy within teams and the scale consists of 5 items. “Payback needs to be quick and nasty” and “People who mess with me always regret it” are the examples of items that are used in this measurement.

Measures of Team Processes Components:

In order to measure the first four innovation related group processes West and Anderson's Team climate inventory (TCI) model was used (Beaulieu et.al, 2014). Additionally, to measure the last three group processes, which are *team cohesion* (Koys and Decottis, 1991), *group communication* (Keller, 2001) and *task and relationship conflict* (Jehn, 1995), existing developed scales were used. This data was also gathered from the team members.

Shared Vision: Team vision is the first and foremost process involved in the aforementioned TCI approach of team innovation. This process stresses the importance of building shared objectives within teams by way of saying to make sure that every member is on the same page about the vision of the collective effort. Shared vision and following three team process measures were proposed by West and Anderson, and the short 19-item version of this scale was obtained from the work of Beaulieu and her associates (2004). The

scale consists of 4 items. An example item is “How clear are you about what your team’s objectives are?”

Participative Safety: This team process was originally created by Amy Edmondson in 1999. As explained before, this process is about ensuring each member's comfortable participation, particularly during the idea sharing practices. This scale comprises 6 items one of which is “People feel understood and accepted by each other”.

Support for Innovation: Distinct from participative safety, this process emphasises the importance of mutual support and encouragement for the ideas created within the team. Therefore, sharing ideas in an easy manner within the team is not enough for innovative outcomes. Teams also need to support these shared ideas and build on these thoughts. There are 5 items included in this scale. One of these, for instance, is, “Members of the team provide and share resources to help in the application of new ideas.”

Task Focus: The fourth and final climate innovation inventory process is interested in team members` focus on the tasks in hand. This process is considered vital for both the creativity and implementation phases of the innovation, because it helps the group to prevent from painful distractions along the way (Tjosvold, Tang and West, 2004). The scale used for measuring task focus within teams, involves 4 items. “Do members of the team build on each other's ideas in order to achieve the highest possible standards of performance?” is one of the items of the scale used for measuring the task focus level of the teams.

Team Social Cohesion: This variable is about the extent to which member’s feel attachment to their team and their eagerness to be a part of the team. This process variable

is the one that triggers sharing and a togetherness attitude within the team. Accordingly, social cohesion within the team has been considered as a necessary precondition for team innovation by scholars (Woodman et al., 1993; Im, Montoya and Workman, 2013). There were 5 items within the scale. One of the items was “There is a personal interest in the team”.

Team Communication: The relationship between effective communication and team innovation is a well-known association. Idea and knowledge-sharing among members has been found to be a strong determinant of team innovation. (Ancona and Caldwell, 1992, Keller, 2001). Therefore, the present research also included this variable as a predictor of team innovation. An example of an item involved in this measure is “How frequently are there task related communication inside your team?”, and there are 4 items that come with the scale.

Task Conflict: Creative abrasion among team members has been argued as another important predictor of team innovation, since intense communications and building on ideas may result in creation of new knowledge and innovation within the team (Leonard, 1998; Davenport and Prusak, 1998). In addition, research supports these arguments and underlines the importance of task-related conflict and minority dissent (Shalley and Gilson, 2004; De Dreu and West, 2001). There were 4 items used in the task conflict scale and one of the items is stated as in the statement; “How often do people in your team disagree about opinions regarding work being done”.

Relationship Conflict: The final innovation-related process measurement is relationship conflict. As can be understood from the name of the variable, it measures the extent to which conflicts are related to members’ interrelationships. This process variable is

mostly accepted as negative (De Dreu, 2006) and was also found to be negatively related to performance outcomes (Jehn, 1995). This scale also comprised of 4 items and one of them is “How much tension is there among members in your team?”.

Measures of Team Output:

Team Innovative Performance: Team innovative performance was assessed by the external judges of each team using a questionnaire (Alper et al, 2000, Taggar, 2002). Additionally, each team had one assessor (manager or supervisor) who rated the innovative performance of the related team. In other words, judges were asked to evaluate innovative performance of the knowledge worker teams in R&D context. West and Wallace`s (1991) effective four-item scale for team innovation was adopted for this research. This developed scale focuses on the initiation of new procedures, developing innovative ways to reach team targets, and improving and developing skills to facilitate innovation (Zahavy and Somech, 2001).

Control Measures:

The sample used in this study can be considered as moderately small. Hence, it was important to decide on the number of control variables that are relevant for the present study. Accordingly, the control variables listed below were worth considering and thus are included in this study so as to account for the possibility of any puzzling effects on the research results.

Leadership Measure: The transformational leadership measure that was developed by Carless, Wearing and Mann (2000) was used in this study as a control measure as transformational leadership, was found appropriate within knowledge intensive R&D context (Gumusluoglu et al, 2013). The leadership variable is aggregated through a calculation of mean values of the leadership rankings of each member within a particular team.

Demographical Variables: The variables like gender and age were also used as control variables in this research with the purpose of eliminating potential alternative influences on the results observed in this research (Baer et al, 2008). Additionally, because team level performance is the focal point of this study, the individual level variables such as gender and age were aggregated to the team level. With regards to age, the average scores of age is calculated for each team and gender variable is aggregated through computing the proportion of men within the whole sample. The results demonstrated that gender variable is significantly related with innovative performance of Knowledge worker teams. Therefore, only the gender was added as control variable in the data analysis. The table below shows the association scores of control variables with team innovative performance.

Table 4.9: Values Related with Association Between Control Variables and KWT Innovative Performance

CONTROL VARIABLES	R²	(B)	(β)	p
Transformational Leadership	.007	.142	.086	.539
Gender (Proportion of men)	.129	1.118	.360	.008
Age	.008	-.015	-.091	.519

4.6.4 Validity Analysis

Exploratory factor analysis was done on the main scales that are used for study 2 to measure the validity of the measures used in the study, and to understand how they are related to each other. In addition, principal axis factoring was used as an extraction method. A KMO test has been done in order to see adequacy level of sampling used for each scale,

and a Barlett test was included, as in the first study, to understand how sufficient the correlations of scale items are.

4.5.4.a) Exploratory Factor Analysis (EFA):

In order to assess the consistency between expected factor structures and actual data, exploratory factor analysis was administrated on each scale used in this study. Once again principal factor analysis (PAF) was conducted on all items of each scale. Additionally, direct oblimin rotation was operated in pursuance of reinforcing correlation between the factors. The scree plots created after EFA and related theory provided a basis for determination of the number of factors used (Dawson, forthcoming). Eigenvalues that are greater or close to 1 are considered significant through analysing the scree plots created, and these values are used for the determination of the factors. Additionally, pattern and factor matrices included in the outputs of the EFA analyses were analysed to decide the measuring strength of used scales. Items with loadings below 0.4 were suppressed from the matrices (Hinkin, 1988). Again, it is worth noting that scales used in Study 2 are well-established measures.

The input factor for study 2 is personality variable, similar to study 1. However, as mentioned before, the calibre of measurement of personality is extended in this study, and in addition to big five personality scales, the dark triad personality traits were also included in study 2. Again, one of the well-known original big five personality instruments (BFI) used in study 2 (John and Srivastava, 1999). Moving on to the second dark triad dimension of the personality assessment, Short Dark Triad Measurement (SD3) which was developed by one of the scholars who launched the well-known dark triad concept (Jones and Paulhus, 2014; Paulhus and Williams, 2002) was used. The SD3 measurement of dark triad personality traits is an original and validated measurement which has been used by other scholars in different contexts (Funham, Richard, Rangel and Jones, 2014; Eklund and Hultman, 2015).

Additionally, in order to determine the unidimensionality of the subscales, I ran EFA for each scale included in the BFI and SD3 personality measurements.

Turning to process and output variables, all of the scales that were used to evaluate team process variables, are original and validated scales, as introduced and explained within the measurement section (5.1.2) of the methods chapter (Hulsheger et al, 2009). In addition, the innovative performance scale used in this research is adopted from the article written by West and Wallace (1991). Once again, it is a validated and original measure of team innovation (Zahavy and Somech, 2001).

Based on the scree plots outputs of EFA, all scales including input, process and output variables, indicated a single prominent factor. The tables related to EFA analysis and scree plots of each scale can be found in the appendix section A. The dimensions of the used measurements accounted for some proportion of variance in their items. These percentages are presented in table below.

Table 4.10: Cumulative Proportions of the Factor Analysis Dimensions

<u>VARIABLES</u>	<u>CUMULATIVE % (ONE DIMENSION)</u>
<i>BIG FIVE PERSONALITY TRAITS</i>	
<i>Agreeableness</i>	26.6%
<i>Extraversion</i>	47.9%
<i>Conscientiousness</i>	38.3%
<i>Neuroticism</i>	39.9%
<i>Openness to experience</i>	33.3%
<i>DARK TRIAD PERSONALITY TRAITS</i>	
<i>Machiavellianism</i>	39.9%
<i>Narcissism</i>	52.4%
<i>Psychopathy</i>	36.4%
<i>TEAM PROCESSES</i>	

Team Cohesion	61.6%
Team Participation	70.1%
Team Support for Innovation	77%
Team Shared Objectives	65%
Team Task Focus	73.8%
Team Communication	60.5%
Relationship Conflict	78.1%
Task Conflict	57.8%
TEAM PERFORMANCE	
Team Innovative Performance	60.2%

4.5.4.b) Reliability Scores and Correlation of the Variables

In the present study, the reliability scores of all the variables included in the extended team innovation model were calculated. What is more, in order to understand the correlation among main variables the Pearson's correlation coefficient method and two tailed significance tests were run using SPSS software. The tables below present both reliability values of the variables and the correlation scores among these variables.

Table 4.11: Means and Standard Deviation of the Values of the Variables

<u>Variables</u>	<u>Mean</u>	<u>Standard deviation</u>	<u>N</u>	<u>Cronbach's Alpha</u>	<u>Number of Items</u>
<i>Big Five Personality Traits</i>					
Extraversion	3.6493	.24103	53	.840	8
Conscientiousness	3.7834	.27751	53	.776	9
Agreeableness	3.9428	.18784	53	.639	9
Openness to experience	3.8279	.23391	53	.752	10
Neuroticism	2.4091	.26978	53	.775	8
<i>Dark Triad Personality Traits</i>					
Machiavellianism	2.5606	.38272	53	.693	5
Narcissism	2.6946	.38809	53	.693	6
Psychopathy	2.0860	.27809	53	.640	5
<i>Team Processes</i>					
Team Shared Objectives	3.9361	.33561	53	.819	4
Team Participation	3.8866	.47084	53	.913	6
Support for Innovation	3.7959	.47531	53	.925	5
Team Task Focus	3.5833	.45271	53	.880	4
Team Cohesion	3.8195	.49041	53	.822	5
Team Communication	3.6205	.44062	53	.776	4
Relationship Conflict	1.9115	.47347	53	.906	4
Team Conflict	2.5683	.44780	53	.749	4
<i>Team Performance</i>					
Innovative Performance	3.8874	.67620	53	.838	3
<i>Control Variables</i>					
Transformational Leadership	3.8235	.54893	53	.942	7

Table 4.12: Correlation Table for Team Variability Elements

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.Agreableness	1													
2.Extraversion	.157	1												
3.Conscientiousness	-.041	-.073	1											
4.Neuroticism	.184	.216	.395**	1										
5.Openness	.031	.059	.323*	.084	1									
6.Machiavellianism	.160	-.133	-.122	-.151	-.178	1								
7.Narcissism	.024	.159	-.106	.093	-.083	.091	1							
8.Psychopathy	.083	-.247	.075	-.141	-.108	.238	.178	1						
9. Team Innovation	.063	.025	.111	.192	.019	.172	-.155	-.001	<u>1</u>					

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

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

Table 4.13: Correlation Table for Team Mean Level Elements

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	2	2
1.Agreableness	1																					
2.Extraversion	.035	1																				
3.Conscientiousness	.134	.364**	1																			
4.Neuroticism	-.314*	-.248	-.454**	1																		
5.Openness	.133	.210	-.092	-.016	1																	
6.Machiavellianism	-.014	.384**	.143	.188	-.019	1																
7.Narcissism	.006	.583**	.073	.104	.188	.552**	1															
8.Psychopathy	-.220	.251	-.004	.317*	.008	.650**	.543**	1														
9.Transformational Leadership	.207	.289*	.069	.035	-.070	.232	.214	.111	1													
10.Team Cohesion	.339*	.264	.004	-.095	-.022	-.049	.014	-.222	.554**	1												
11.Team Participation	.099	.354*	.222	-.150	-.188	.227	.205	.102	.601**	.606**	1											
12.Support for Innovation	.007	.423**	-.048	.083	.103	.233	.346*	.206	.664**	.550**	.620*	1										
13.Shared Objectives	.020	.310*	.064	.069	.002	-.010	.195*	-.061	.441**	.388**	.560**	.521**	1									
14.Task Focus	.173	.531**	.167	.024	-.028	.224	.311*	.124	.728**	.601**	.681**	.736**	.536**	1								
15.Team Communication	.259	.444**	.198	.077	-.106	.248	.277*	.036	.546**	.449**	.424**	.620**	.380**	.783**	1							
16.Relationship Conflict	-.219	-.110	.000	.110	.120	.086	.036	.198	-.401**	-.688**	-.628**	-.348*	-.497**	-.424**	-.272	1						
17.Task Conflict	-.234	-.166	-.032	.109	.181	.091	.040	.194	-.333*	-.574**	-.446**	-.446**	-.578**	-.528**	-.478**	.629**	1					

18.Innovative Performance	.040	-.254	-.227	-.020	-.031	-.136	-.262	-.190	.086	.218	.146	.204	-.079	-.038	.053	-.125	.025	1				
20.Gender	-.156	-.170	-.067*	-.292*	-.055	-.267	-.381**	-.316*	-.154	-.004	.086	-.060	-.105	-.150	-.189	.005	.083	.360**	1			

It is worthwhile noting that, the correlation table above indicates some notable relationships particularly between a number of personality traits and innovation related team processes. In addition, based on the results in the table, transformational leadership has also have an influencing power on the innovation realted team process. Finally, gender as an another control variable is the only variable that is positively and significantly related to innovative performance of knowledge worker teams. All of these additional findings will be discussed in the discussion section.

4.7. RESULTS

This results part of study 2 will inform the reader of the statistical methods used during analysis of the data, and the obtained results based on this data. The statistical data presented here indicates the associations between personality composition, team processes and innovative performance of teams in a knowledge-intensive R&D work context. Therefore, this section addresses the statistical methods used for the analysis of the data, and the results related to the test of the developed hypothesis. Once again, multiple regression analysis was applied in order to test the hypotheses, and SPSS software version 21 was used to do all the analyses.

Study 2 includes 3 types of analysis; linear, mediated and moderated regression analyses. Therefore, the results section will start with testing of the hypotheses that were developed and presented in the hypothesis development section. Direct and mediated hypotheses related to mean-level of inputs will be assessed first. Hypotheses indicating direct relationships among input and output variables were tested through linear regression analysis, and hypotheses predicting mediated relationships were tested via mediated regression analysis. Then, in the following part, the assessment of hypotheses predicting moderated relationships (between variability level of inputs and innovative performance moderated by mean level inputs) will follow. The test results of the hypotheses in both parts will be presented in tables below.

Study 2 also includes control variables; age, gender and leadership, so that any obscuring influences can be accounted for. For instance, teams that are supervised by transformational leaders might have higher innovative performance scores, and these types of results may have a misleading influence on the results which are expected to be related to the direct, mediated or moderated relationships.

4.7.1 Hypothesis Testing

In this part of Study 2, the hypotheses which are proposed in section 4.5. are tested and the results are presented. The results of the hypotheses testing provide information about the linear, mediated and moderated relationships among variables that are used in input-process-output model. To put it another way, the tested results of the hypotheses assist to understand the interplay between personality composition, innovation related team processes and innovative performance.

4.7.1.a) The Results Related to Linear Relationships between Mean Level Inputs and Outputs

The mean-level hypotheses were proposed to analyse the relationships between input (big five and dark triad personality traits), team processes and output (innovative performance). Multiple regression analysis was used to test the relationships among variables. Accordingly, linear regression analysis was used to test the direct (non-mediated) relationships, and mediated regression analysis was used to test the relationships that are explained by mediators (innovation related team processes). Syntax commands were used via SPSS 21 software in order to test not only the linear relationships between inputs and outputs but also examine the mediated relationships among inputs, processes and outputs. Additionally, age, gender and leadership were control variables of Study 2. However only the gender construct has a significant relationship with the innovative output. The first table below presents the results related to the linear associations between mean level inputs and outputs, The values for each dimension represents separate regression scores. The values related to the mediated relationships between mean level input, process and output variables within the model are included in the second table.

Table 4.14: The Results of Team Mean Level Input-Output Related Hypotheses

	R ²	(B)	(β)	p
<u>Extraversion</u>	.189			
Extraversion Mean Value		-.206	-.234	.087
Extraversion Squared. Value		-.108	-.151	.258
Gender (Control Variable)		.273	.309	.023
<u>Agreeableness</u>	.143			
Agreeableness Mean Value		.070	-.080	.569
Agreeableness Squared Value		-.053	-.069	.620
Gender		.334	.379	.007
<u>Conscientiousness</u>	.280			
Conscientiousness Mean V.		-.176	-.200	.140
Conscientiousness Squared. V.		.014	.021	.882
Gender		.310	.351	.012
<u>Neuroticism</u>	.137			
Neuroticism Mean Value		.082	.093	.504
Gender		.341	.387	.007
<u>Openness</u>	.129			
Openness Mean Value		-.010	-.012	.930
Gender		.317	.359	.009
<u>Machiavellianism</u>	.131			
Mach. Mean Value		-.038	-.043	.755
Gender		.307	.348	.014
<u>Narcissism</u>	.147			
Narcissism Mean Value		-.128	-.146	.308
Gender		.268	.304	.036
<u>Psychopathy</u>	.136			
Psychopathy Mean Value		-.075	-.085	.542
Gender		.293	.333	.020

***p≤0.001, **p≤0.01, *p≤0.05

Table 4.14 demonstrated the results regarding the relationships mean level inputs and outputs. According to the table the results related to curvilinear relationships between mean level inputs (agreeableness, extraversion, conscientiousness) and innovative are indicated through squared values and they are not statistically significant. In this regard, as indicated in the figure 4.24 the associations indicated in the hypotheses H1a, H2a, H3a are not revealed as notable

relationships. Moving on to the findings related with predicted linear relationships between mean level inputs (neuroticism, openness, Machiavellianism, narcissism and psychopathy) and innovative performance, once more the input and output variables do not have considerable associations among each other. Therefore, as showed in the figures below, the relationships predicted in the hypotheses (H1a, H2a, H3a, H4a, H5a, H6a, H7a, H8a) revealed as nonsignificant.

Figure 4.23 Results of the hypotheses related to direct relationships between dark triad and innovative performance

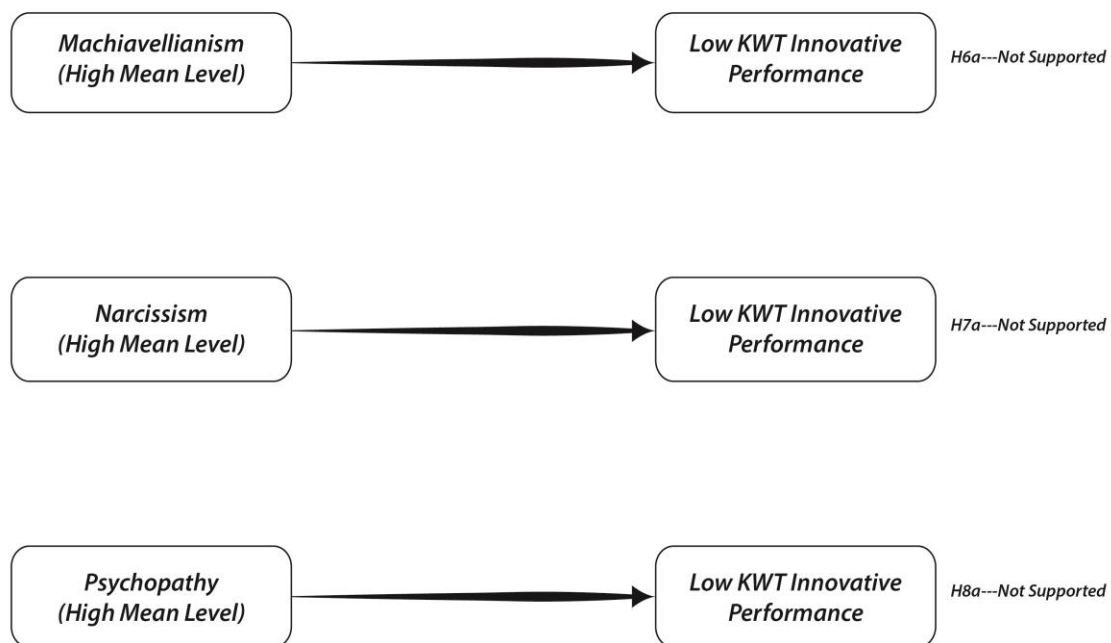
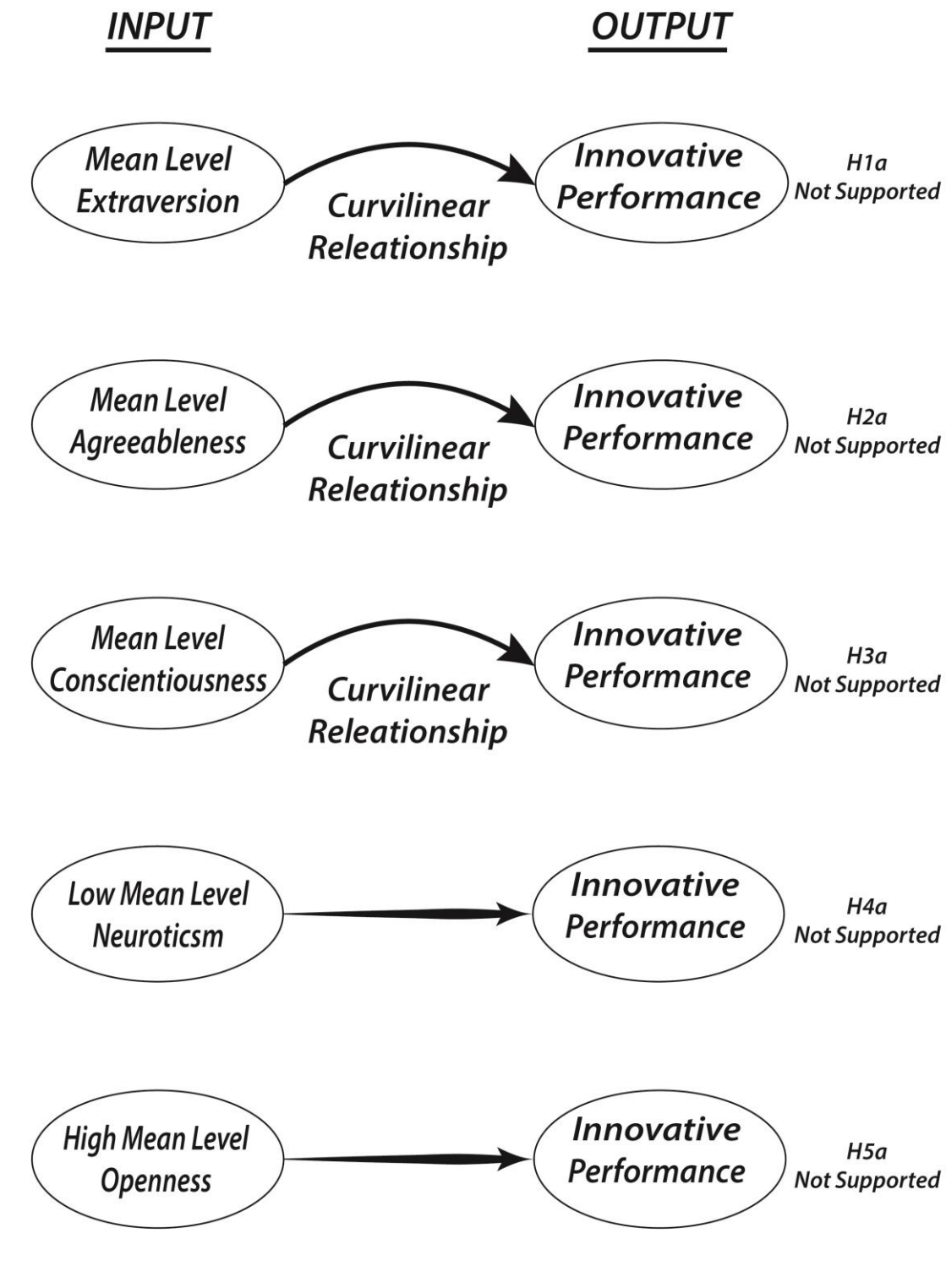


Figure 4.24 Results of the Hypotheses related to big five personality traits and innovative performance



4.7.1.b) Results Related to Mediating Relationships between Inputs, processes and Outputs

The table below shows the results of mediated regression analysis. Syntax commands were used via SPSS 21 software in order to test the predicted associations among input, process and output variables. Age, gender and leadership were control variables of Study 2 however only the gender construct has significant relationship with the innovative output. As can be seen from the table none of the hypotheses including mediated relationships found a significant support since there is no similarity between lower and higher confidence limits. To put it another way, none of the mediation results are significant, because all of the confidence intervals include zero.

Table 4.15: Mediated results of Mean Level of Inputs - Team Processes - Innovative Performance Relationship

Hypotheses	Independent Variable	Mediating Variable	Dependent Variable	Effect Size	Mediating Effect Lower Confidence Limits	Mediating Effect Higher Confidence Limits
H1b	Extraversion	Team Communication	Innovative Performance	.0002	-.0571	.0522
H2b-H2c	Agreeableness	Team Cohesion (H2b)	Innovative Performance	-.0112	-.2099	.0372
		Task Conflict (H2c)	Innovative Performance	.0068	-.0312	.1012
H3b	Conscientiousness	Task Focus	Innovative Performance	-.0209	-.1594	.0160
H4b	Neuroticism	Participative Safety	Innovative Performance	-.0156	-.0956	.0179
		Participative Safety	Innovative Performance	.0106	-.0641	.1743

H5b	Openness	Team Support for Innovation	Innovative Performance	.0239	-.0284	.2059
H6b	Machiavellianism	Relationship Conflict	Innovative Performance	-.0102	-.0855	.0156
H7b	Narcissism	Participative Safety	Innovative Performance	.0396	-.0218	.1295
		Relationship Conflict	Innovative Performance	-.0047	-.1018	.0201
H8b	Psychopathy	Participative Safety	Innovative Performance	.0164	-.0108	.0954
		Relationship Conflict	Innovative Performance	-.0223	-.1212	.0223

4.7.2 The Results of the Moderated Relationships Between Big Five Personality Traits and KWT Innovative Performance

In this section the focus is on the moderated relationships that are indicated in the developed hypotheses. Specifically, the relationships between mean level inputs (independent variables), variability of inputs (moderating variables) and outputs (innovative performance) will be assessed, and the results signaling the interplays between inputs, moderators and outputs will be presented. Moderated regression analysis was used to test the related moderated hypotheses (H1c, H2d, H3c, H4c, H5c, H6c, H7c and H8c) and the results of the related hypotheses tests are presented below.

Similar to Study 1, in Study 2 the moderated interaction between variables were tested through using related syntax commands by using SPSS 21 software. The results of the hypotheses testing will be shown in the table 4-16 below. The first three section of the table represent the interaction between moderator and curvilinear relationship between input (extraversion, agreeableness, conscientiousness) and innovative output. Therefore, they include additional squared values and interactions. The values that are presented in the fifth lever of each 3 table is particularly represents the predicted moderated curvilinear relationships. Additively, the last 2 sections of the table include results related with moderated linear relationships and the third lever particularly indicate such interactions. It is also important to note that gender variable also included in the analysis as a control variable as it is significantly realted with the innovative outcome.

Figure 4.25 Results of the hypotheses related to moderating associations between big five personality traits and KWT innovative performance

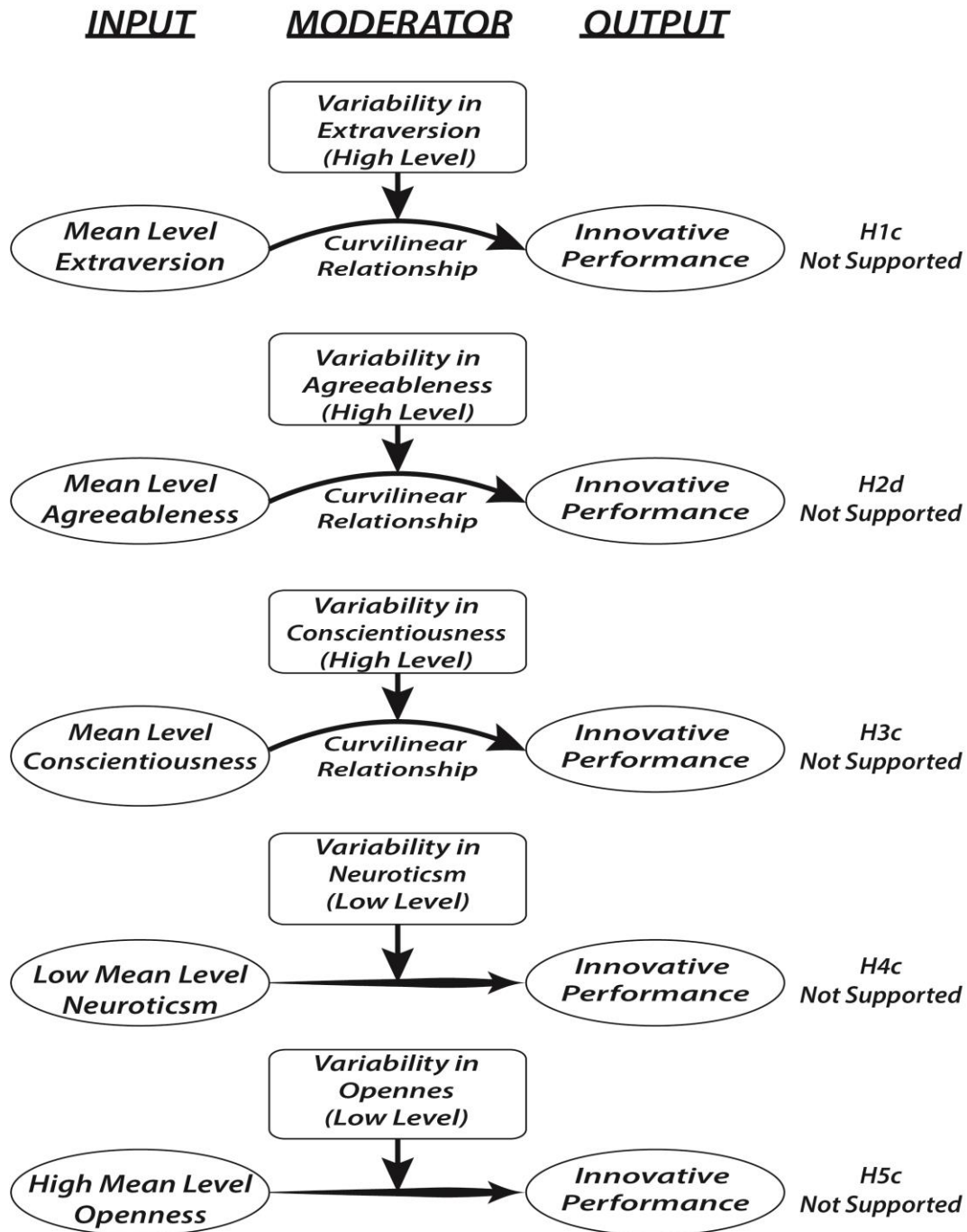


Figure 4.26 Results of the hypotheses related with moderating associations between dark triad personality traits and KWT innovative performance

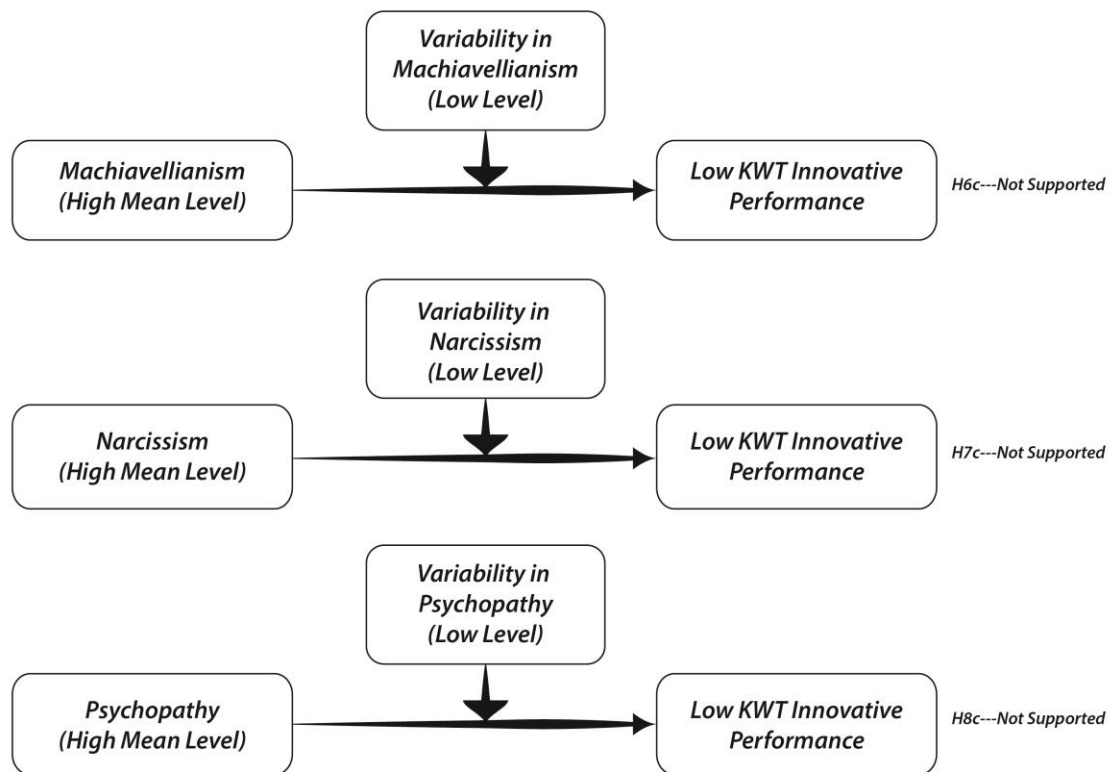


Table 4.16: The Results of the Moderated Relationship Between Big Five and KWT Innovative Performance

	B	(β)	p
Extraversion			
Gender(Control Variable)	.262	.297	.041
Variability in Extraversion	.061	.070	.724
Mean Level of Extraversion	-.229	-.260	.114
Mean Level of Extraversion Squared	-.122	-.170	.260
Mean Level of Extraversion x Variability in Extraversion	.062	.063	.653
Mean Level of Extraversion Squared x Variability in Extraversion	-.091	-.132	.525
Agreeableness			
Gender (C.V.)	.412	.467	.002
Variability in Agreeableness	.273	.310	.138
Mean level of Agreeableness	.128	.145	.317
Mean level Agreeableness Squared	-.069	-.089	.565
Mean Level of Agreeableness x Variability in Agreeableness	-.155	-.155	.300
Mean Level of Agreeableness Squared x Variability in Agreeableness	-.176	-.226	.303
Conscientiousness			
Gender (C.V.)	.320	.363	.016
Variability in Conscientiousness	-.065	-.73	.683
Mean level of Conscientiousness	-.136	-.154	.310
Mean Level of Conscientiousness	.009	.013	.935

Squared			
Mean level of Conscientiousness x Variability in Conscientiousness	.084	.103	.581
Mean Level Conscientiousness Squared x Variability in Conscientiousness	.083	.840	.405
Neuroticism			
Gender (C.V.)	.292	.331	.029
Variability in Neuroticism	.095	.108	.449
Mean Level Neuroticism	.073	.083	.556
Mean Level Neuroticism x Variability in Neuroticism	.074	.108	.473
Openness			
Gender (C.V.)	.299	.339	.017
Variability in Openness	.004	.004	.975
Mean Level of Openness	-.008	-.009	.946
Mean level Openness x Variability in Openness	-.130	-.130	.371

***p≤0.001, **p≤0.01, *p≤0.05

As can be seen from the results of the table 4.16, none of the hypotheses are supported with significant relationships in Study 2. In the table 4.16, the fifth lever of each extraversion, agreeableness and conscientiousness section presents the results related with moderated curvilinear relationships and the findings do not signify any notable interactions. In other words, the results revealed that variability in extraversion, agreeableness and conscientiousness do not have an influencing magnitude on the curvilinear relationships between mean level of extraversion, agreeableness and conscientiousness (respectively) and knowledge worker team innovative performance.

Moving on to the moderated linear relationships, once again test results did not reveal any notable associations. Stated briefly, the influence of low variability in neuroticism on the relationship between low mean level of neuroticism and KWT innovative performance is not significant. Additionally, low variability in openness also does not have an influencing power on the relationship between mean level of openness and KWT innovative performance.

4.17: Results of the Moderated relationships Between Dark Triad Personality Variables and KWT Innovative Performance

RESULT INDICATORS	(B)	(β)	<i>p</i>
<u>Machiavellianism</u>			
Gender (Control Variable)	1.109	.357	.012
Variability Level of Machiavellianism	.097	.109	.417
Mean Level Machiavellianism	-.006	-.007	.958
Mean L. Machiavellianism x Variability Level of Machiavellianism	.147	.168	.219
<u>Narcissism</u>			
Gender (Control Variable)	.268	.304	.039
Variability in Narcissism	-.072	-.081	.577
Mean L. Narcissism	-.097	-.110	.481
Mean L. Narcissism x Variability in Narcissism	.047	.058	.669
<u>Psychopathy</u>			
Gender (Control Variable)	.317	.360	.012
Variability in Psychopathy	-.002	-.003	.984
Mean Level Psychopathy	-.078	-.089	.538

Mean L. Psychopathy x Variability in Psychopathy	.203	.244	.069

***p≤0.001, **p≤0.01, *p≤0.05

Based on the results above, it can be concluded that ,once again, none of the hypotheses (H6c, H7c, H8c) found notable support in the present study. Therefore, there are no significant relationships found regarding the negative impact of high mean-levels of Machiavellianism, narcissism and psychopathy on the relationships between low variability of Machiavellianism, narcissism and psychopathy (respectively) and KWT innovative performance.

4.8. DISCUSSION

This continuing second study is built on the initial study related to personality composition and creative performance of student teams. This study also probes the personality composition and its influence on teams. However, as distinct from study 1, the second study introduces additional, well-known dark triad personality traits and innovation-related team processes. Thus, the present study aims to understand the relationship between personality compositions, team processes and team innovation variables by using the well-known Input-Process-Output model of team innovation. It is worth noting that most studies related to team innovation analyse the other factors' (team size, task interdependence, job relevant or background diversity, etc.) influences on team innovation. Therefore, this study is important in terms of understanding the role of personality variables on team innovation by using an integrated conceptual model.

Innovation-related team processes analysed in the extended IPO model of team innovation include task focus, team participation, shared vision and support for innovation, team communication, team cohesion, task and relationship conflict. Of these eight determinants, the

first four are predominant in terms of team innovation (West and Anderson, 1996). The latter four have gained relatively less attention. However, with this study, the interplay between these eight processes and personality and team innovation was examined in an innovation-oriented, knowledge-intensive context (Hulsheger *et al.*, 2009).

As a result, this section addresses how personality traits relate to innovative performance and the mediating role of innovation-related processes on the relationships. Surprisingly, the results of this study showed no significant relationship among all input, process and output variables within the extended IPO model of team innovation. Hence, none of the predicted hypotheses were supported by the results, as in the initial study. The findings and related literature are considered, and the relationships in question are discussed below.

4.7.1. Extraversion

The first projected hypothesis predicted a curvilinear relationship between extraversion and innovative performance of knowledge worker teams. The expectation behind this prediction was that some level of extraversion is needed to ease communication. However, such levels shouldn't be so high, or conflicts may occur due to the domination of rival extroverts. Alternatively, high extraversion leads to too much communication, which may deter the task orientation within the team. However, the results of this study do not show any salient association between extraversion and team innovation.

Moreover, the present study also attempted to analyse the mediating role of team communication between mean levels of extraversion and team innovation. However, team communication does not have the magnitude to explain this relationship. Additionally, the third

hypothesis considered the moderating influence of the variability in extraversion on the relationship between mean-level extraversion and knowledge worker team innovation. Once again, the results do not support this hypothesis and demonstrated that high variability in extraversion does not have any significant influence on the curvilinear association between mean level extraversion and team innovation.

These findings may indicate the importance of innovation-related communication within teams. Based on the findings, it can be said that being able to have some level of formal and informal talk within the team may not always lead to innovation. To interact and share knowledge effectively for innovation, members need to tackle knowledge boundaries, particularly in knowledge-intensive work contexts (Carlile, 2002; 2004). Thus, teams may need to include members with t-shaped skills, who have wider intellectual and comprehension capabilities that could enable them to collaborate with members or experts across disciplines in order to facilitate the deep tacit knowledge-sharing required amongst knowledge workers. Otherwise, teams may indeed have extrovert members who facilitate talk and basic level communication, yet these types of formal and informal interactions may not be enough to deal with the complexity of innovation.

Notably, the data analysis outcomes of the current research project revealed significant associations between extraversion and the majority of the innovation-related team processes. Extraversion was found to cause participation, support for innovation and communication within knowledge worker teams, since the sociable, cooperative and communicative sides of extroverted individuals may stimulate communication and a participative climate within the team

(Taggar, 2002; Peeters *et al.*, 2006). This implies that team members experience participative and supportive relationships with others in the group, if the extraversion of most of the members is reasonably high.

In effect, the findings of this study have importance with regards to certain conflicting views in the literature. There is an argument within the literature that elevation in extraversion comes with assertiveness and dominance within the team. Thus, having high levels of these characteristics results in conflicts among team members, and impairs participation along with the positive climate within the team (Barry and Stewart, 1997; Mohammed and Angell, 2003). On the other hand, others argue that extroverted individuals have a desire to work in groups and should therefore be inclined to engage in actions that assist teams in being workable (Barrick *et al.*, 1998). Accordingly, these latter claims were further supported by the findings of this research, which reveal a positive correlation between mean-level extraversion and team communication, as well as participation (Barrick *et al.*, 1998; Van Vianen and De Dreu, 2001). As a result, different lines of reasoning have resulted in a discrepancy within the literature (Barrick *et al.*, 1998), and the findings of this study corroborate the claim that underlines the positive impact of psychological states and the climate within knowledge worker teams (Watson and Clark, 1984). A possible explanation for this discrepancy is that the conflict and power-oriented characteristics - like dominance and assertiveness - are downplayed by the cooperative and participative team climate facilitated by extroverted members within the team.

Finally, when it comes to task- and objective-related team processes, the current study also revealed noteworthy influences of mean-level extraversion on shared team objectives, support for innovation and task focus. Once again, there are contrary views to these findings, and several scholars have highlighted extroverts' tendency to social interaction may distract the

team's attention from objectives and task completion (Barry and Stewart, 1997; Mohammed and Angell, 2003). However, as stated above, this research revealed the positive impact of extroverts on task-related processes. Furthermore, the present findings of this research do not demonstrate any significant relationships between mean-level extraversion and conflict-related team processes. In light of these findings, it can be argued that in knowledge-intensive contexts, the particularly negative characteristic features of extraversion are downplayed by professional attitudes, responsibilities and positive emotional states of extroverted individuals. The energetic, proactive and sociable features of extroverts not only enhance task cohesion, but also positively influence the innovation-related processes within the team (Van Vianen and De Dreu, 2001).

4.7.2 Agreeableness

All hypotheses related to agreeableness are not supported by the present study. In other words, the expected curvilinear relationship between mean-level agreeableness and knowledge worker team innovation were not adequately supported by the results of this study. Additionally, the mediators' (team cohesion and task conflict) role on explaining the relationship was not promising. Furthermore, current research did not find any influence of the variability of agreeableness on the same relationship between mean-level agreeableness and team innovation. These results indicate the passive role of agreeable individuals when the focus is on innovation. Although previous research has found supportive results between both mean-level agreeableness (Barrick *et al.*, 1998; Neuman *et al.*, 1999; Neuman and Wright, 1999; Van Vianen and De Dreu, 2001) and variability in agreeableness (Peeters *et al.*, 2006) and general team performance, this research found no significant relationship between agreeableness and team innovative performance in a knowledge-intensive context. I believe this is a salient indicator of the influence that agreeable personalities can have on complex tasks, and in a distinct context. Put another way, innovation-oriented teams are distinct from general

performance teams, and it seems that the cooperative and acceptant role of agreeable individuals may not be vital for teams working in a knowledge-intensive context. To this end, agreeable characteristics may not fit with norms of knowledge worker teams; instead, individuals who asks critical questions may gain more credit in postmodern teams, particularly when innovation is the focus. Therefore, future research may need to focus on different personality characteristics that may play a more salient role in innovative teams.

When it comes to the relationship with team processes, the results of the current study indicate a positive correlation between agreeableness and team cohesion. Therefore, this is an important finding that demonstrates the role of agreeableness on maintaining a friendly and cohesive climate within the team. However, this positive relationship is not surprising since, in the literature, there are arguments and findings based on the crucial role of agreeable individuals on generating a cooperative and positive atmosphere, such that team members can easily socialise and team up together (Barrick *et al.*, 1998; Van Vianen and De Dreu, 2001).

4.7.3 Conscientiousness

Contrary to expectations, this research does not reveal any significant findings regarding the role that conscientiousness and conscientious members play within the team. Additionally, no support was found for the mediation of personality – outcome relationship by task focus process variable. This finding is consistent with the arguments of the scholars probing the relationship between team creativity and personality. According to these researchers, conscientiousness is not appropriate for creativity-related tasks owing to the highly focused, literal-minded nature of these individuals (Litchfield *et al.*, forthcoming). Research results are also mostly in line with the findings of the present research in that they indicate that conscientiousness does not have a

predictive value in terms of team creative performance (Driskell *et al.*, 1987; Bolin and Neumann, 2006; Baer *et al.*, 2008).

Notably, Baer and co-workers found that the curvilinear relationship between conscientiousness and creative performance is significant only if the members comprising the team have high creative confidence. Thus, one possible explanation for the findings of the present study is that this research does not include the creative confidence variable as a moderator of the predicted inverted U-shaped relationship between conscientiousness and knowledge worker team innovative performance. It may be that the conscientious members of the knowledge worker teams investigated may not have adequate confidence for innovation, and this may lead to a passive influence on the innovative performance of the teams.

Moreover, one other research group found a negative relationship between conscientiousness and team creativity. In their study, the scholars also aimed to reveal the explanatory factors behind the negative relationships they found by testing idea generation, idea sharing and use of systematic processes as mediator variables. However, they could not find any significant negative association between conscientiousness and idea generation and idea sharing, and considerable positive correlation between conscientiousness and systematic processes (Robert and Cheung, 2010). Taken together, studies investigating the relationship between conscientiousness, creativity and innovation (including this research) indicate a complex relationship between conscientiousness and innovation. Therefore, more research, in particular on this topic, needs to be undertaken before the impact of conscientiousness on team innovation is more clearly understood. Basically, the implementation stage of innovation needs specific attention, particularly when it comes to the impact of conscientious members on innovation, since these individuals are highly motivated towards task completion. Moreover, a

qualitative study may reveal the explanatory factors that need to be considered when scrutinising the complex association between conscientiousness and innovation.

Moving on to the relationship with innovation related team processes, the prediction was mainly on positive relationship between task focus and conscientiousness (Van Vianen and De Dreu, 2001). Contrary to expectations, this research did not find any significant association between conscientiousness and team process variables. All associations considered, this research demonstrated that task type might have an effect on the role of conscientious team members, since there is considerable discrepancy between the findings on the role of conscientious members on general or routine team performance, and creativity and innovation-oriented team tasks. To this end, the impact of conscientious members diminishes not only team processes but also the innovative efforts of knowledge worker teams when the task involves high levels of complexity and ambiguity (Alvesson, 2004; Baer *et al.*, 2008).

4.7.4 Neuroticism

This research did not find any significant relationship between neuroticism and innovative performance. Therefore, the three predicted hypotheses related to neuroticism are not supported by the findings of this study. In other words, both mean and variability levels of neuroticism are not related to team innovation. Although the hypotheses were based on strong theory and findings in the literature related to team effectiveness (Mohammed and Angell, 2003), the recent research, which is related to creative performance instead of general performance, does not show any significant relationships. Thus, in contrast with the theoretical developments, the results revealed by this research are in line with the recent trend observed in

the literature when it comes to the relationship between neuroticism and innovation (Bolin and Neumann; 2006; Baer *et al.*, 2008). One explanation could be that in a highly competitive context, the influence of neurotic tendencies may be downplayed by the complexity of the tasks themselves and, therefore, the expected negative influence of neurotic individuals was not of sufficient magnitude, either directly or indirectly through participative safety on innovative performance.

4.8.5 Openness to experience

Considering the consensus in theory and research findings on openness to experience and its relationship with creativity and innovation at individual levels (Hammond, Farr, Schwall and Zhao, 2011; Shalley *et al.*, 2004; Betchtold *et al.*, 2007), perhaps the most surprising result of this study is that relating to openness to experience. In the literature, openness to experience is arguably to be the most significant variable in terms of innovation (Hammond, Farr, Schwall and Zhao, 2011). However, when it comes to team level association between mean-level openness and creativity, the research in hand does not support the findings in the literature (Robert and Cheung, 2010; Schilpzand *et al.*, 2011; Bolin and Neumann, 2006; Baer *et al.*, 2008), and in fact this research is an addition to the inquiries above. The additional contribution of this research is that it indicates that when the desired outcome is innovation rather than creative performance, the relationship is still not salient, at least in this context.

Of note here, however, was that when the focus is the impact of variability there is one research finding that indicates the importance of diversity in openness to experience on creative performance. Contrary to this finding, this research predicted a positive impact due to homogeneity in openness to experience based on strong theoretical arguments and the strong association of openness of individuals and innovation (Betchtoldt *et al.*, 2007). However, with

this research we see that when the focus is innovation, the variability level of openness has no influence on the relationship between mean-level openness and innovation in team levels. Baer and co-workers (2008) explain the relationship between openness and creative performance by including a creative confidence factor as an enhancer of the strength of the relationship. In this sense, any future research examining the relationship with alternative moderators may indicate new directions and assist the conceptualisation of the interplay between openness to experience and team innovation.

4.7.6 Machiavellianism

The hypotheses that predicted the first dark triad trait, Machiavellianism, and its relationship between team processes and team innovative performance were not supported by this research. The first hypothesis considered the negative and linear relationship between mean level Machiavellianism and knowledge worker team innovative performance. However, this research did not reveal any impact on the teams' innovative performance. Although I expected the manipulative and self-centred nature of Machivellianists would distract the processes related to interpersonal dynamics, sense of mission among members, team cohesion, relationship conflict and task focus processes do not explain the relationship between Machiavellianism and team innovation. One explanation for the insignificant results related to predicted relations is that the negative influence of Machiavellis on the team dynamics may need a prolonged time to reveal itself as a prominent factor. Furthermore, the complexity and intensity of the knowledge work may also curtail the negative influence of Machiavellianism within the knowledge worker teams.

4.7.7 Narcissism

The second dark triad trait was narcissism, which refers to the self-praise and egotism of members. Based on the existing literature and findings regarding narcissists in a team context, I argued and predicted that the negative characteristics of narcissistic individuals may harm relationships and effective communication within the team, which may in turn have curtailed the innovative efforts of the knowledge worker team (Campbell *et al.*, 2000; Gabriel *et al.*, 1994). However, the results of the present research demonstrated that the influence of narcissistic characteristics are not significant when it comes to innovative performance of teams in a knowledge-intensive context. Moreover, the mediating team processes of cohesion, communication, participative safety and relationship conflict within teams cannot explain the relationship between mean-level narcissism and KWT innovative performance either. The reason behind these findings might share some similarity with Machiavellianism, and the expected negative influence of narcissism on team innovation through participation, communication, cohesion, and relationship conflict processes may have been weakened by the complex nature of the project, which needs to be completed in a limited time period. In fact, such findings and arguments generate salient new research directions with regards to the impact of stress levels, complexity and time limits of the task on the influencing power of personality on team innovation.

Turning to the effect of variability in narcissism on the relationship between mean-level psychopathy and KWT innovative performance, it is revealed that even a variety in narcissism has no moderating impact on the relationship. Both theory and research emphasise the fact that narcissists may perform in some individual work contexts, but tend to be counterproductive in a team context (Premuzic, 2015; Judge *et al.*, 2002).

One unanticipated finding was the positive association between narcissism and team processes that support innovation, shared objectives, team communication and task focus; previous studies have reported mostly negative influences of narcissistic personality on intragroup relationships and group outcomes (Kayes, 2004; O'Boyle, 2012). The context and task that teams need to accomplish may influence the attitudes and actions of narcissistic individuals (Nevicka *et al.*, 2001). For instance, it has been argued that narcissistic individuals may strive for good performance if they see the work as a self-enhancing opportunity that contributes to the image that wish to present in a work context. Accordingly, Alvesson (2001) clearly indicated the association between identity, image and knowledge work, and argued that identity is an important factor that generates one of the means for knowledge workers to operate together. Moreover, the complexity and uncertainty of the innovation-oriented work itself helps knowledge workers to construct an identity and present an image around the most challenging and ambiguous organisational tasks (Alvesson, 2004; Alvesson and Robertson, 2006). In fact, narcissistic individuals are known as self-enhancers and, therefore, self-praise, identity and growth are highly essential for this type of individual (Jonason *et al.*, 2011). Therefore, narcissistic team members may perceive knowledge work as a self-enhancement opportunity that assists them in constructing their identity, as well as building their image within the organisational phenomena. Accordingly, they may be prone to support the team, agree on shared goals, engage in discussions and focus on innovative outcomes.

4.8.8 Psychopathy

Psychopathy might be the most negatively perceived construct of the dark triad personality traits, and this perception is reflected within the theory and research hypotheses (Hare and

Neumann, 2009 O'boyle *et al.*, 2012; Scherer, Baysinger, Zolynsky, LeBreton, 2013). However, it is somewhat surprising that in this study there is a lack of significant relationships between psychopathy and innovative performance of teams composed of knowledge workers. Moreover, it has been predicted that there is a mediating relationship between psychopathy and KWT innovation through participative safety, cohesion, team communication and relationship conflict.

Given the intense focus on the negative side of psychopaths at individual levels within the literature, research findings related to general team performance also signify the counterproductive tendencies of psychopaths in teamwork conditions (Scherer *et al.*, 2013; Babiak, Neumann and Hare, 2010). However, to the best of my knowledge, there is no study that probes the specific relationship of psychopaths and their influence on team innovation, particularly in a knowledge-intensive context. Therefore, this study may have characteristics of being the first study to investigate such a relationship. However, the results did not reveal any striking association in terms of either direct or indirect effect (through mediators) of psychopaths on the innovative outcomes of knowledge worker teams. I think this result, once again, supports the argument of the trivial influence of personality in a knowledge-intensive context, and there is the possibility that psychopathic tendencies of individuals are easily downplayed by the complexity, ambiguity and fast-paced nature of the innovation-oriented knowledge work (Newell *et al.*, 2009; Lindkwist, 2005).

Moving on to the variability level influence of psychopathy on the relationship between mean-level psychopathy and KWT innovation, once more, no significant relationship was observed within the results of the present research. In other words, there is no moderating impact of the heterogeneity or homogeneity of psychopaths on the main relationship. This finding can be

considered as further support for the passive role of both psychopathy and personality within teams operating in knowledge-oriented contexts.

It is worthwhile noting that the reason behind the insignificant relationships among variables could be the reliability scores. The agreeableness scale within the big five framework and scales of dark triad framework variables have relatively low reliability scores. Put briefly, the reliability scores of agreeableness and psychopathy are below the expected Cronbach alpha value of .70, and the reliability results of Machiavellianism and narcissism traits are close to the accepted value. In fact, once again, the Cronbach alpha value for extraversion was above .80, and can thus be expected to represent a considerable influence on the results. Drawing on these results, the reliability values of the personality measures used may not be of sufficient magnitude to influence the innovative outcome. It may be noted here, however, that the second study revealed some significant relationships between the personality traits and innovation-related team processes.

Moreover, the skew of the data may also be a reason for the insignificant relationships. However, the analysis demonstrated that the distribution of the variables, including personality traits and team processes (apart from team cohesion and team communication, which are negatively skewed), and innovative outcome are approximately symmetrical. Therefore, the aforementioned symmetrically-distributed variables are eligible to give acceptable distributions within the sample size used in this study.

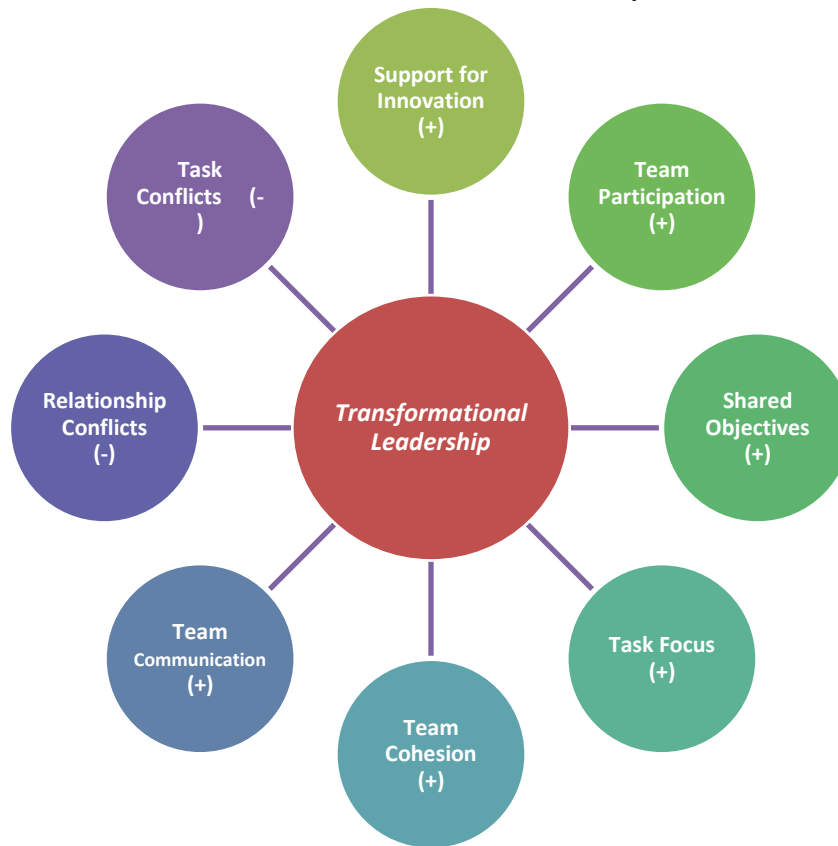
In all, knowledge worker teams are often designed as a project teams and membership in these teams often lasts until the project is completed (Janz *et al.*, 1997). Besides, some members may have other responsibilities in their organisation (Tannenbaum *et al.*, 2012). Hence, knowledge

workers comprising this type of team may not always identify themselves with the team they are attached to, though this may depend on the project itself. As such, members of knowledge worker teams might not associate themselves with the psychological dynamics of the team. In addition, the tight deadlines of the projects may diminish any shared team focus on innovation at the expense of expedience (Newell *et al.*, 2009). All of these reasons may downplay the influence of psychological factors, such as personality on innovative performance of knowledge worker teams. Additionally, these teams may have a more individualistic nature instead of a collectivistic one. In other words, individuals may be evaluated by other members and managers in terms of their contributions and credibility rather than their characteristic tendencies as long as the projects are completed successfully (Monsted, 2003).

4.8.9 The Impact of Control Variables

The findings of this research also indicate that the transformational leadership variable has a significant impact on all innovation-related team processes in a knowledge-intensive context. The linear relationship between transformational leadership and innovation-related team processes signify the importance and influence of transformational leadership, particularly within the knowledge-intensive context. Additionally, these results are in accord with previous findings within the field (Gumusluoglu *et al.*, 2013; Karakitapoglu, Aygun and Gumusluoglu). The results, in fact, demonstrate that for transformational leadership it is important to have innovative climate within knowledge worker teams. It has a positive relationship with cohesiveness, participation, communication, shared objectives, support and focus on innovation within the knowledge worker teams.

Figure 4.27: The Association Between Transformational Leadership and Team Processes



On the other hand, the findings also showed that transformational leadership has a significant negative relationship with conflict-related processes. Although the negative relationship between relationship conflicts is an expected finding, again, the negative association between transformational leadership and team conflict is an unexpected one. One possible explanation for this finding is that transformational leaders may perform effectively when there is no conflict within the team so that these leaders can use their energy to inspire, intellectually guide knowledge workers and build effective relationships with them (Bass, 1990). However, this topic needs further investigation before the relationship between transformational leadership and innovation-related team processes is clearly theorised.

4.9. LIMITATIONS

The purpose of the current study was to examine the interaction between personality compositions, innovation-related processes and innovative performance at the team level in a knowledge-intensive R&D context. This continuing inquiry, in and of itself, has covered many of the limitations of the initial study. However, it still has some limitations that need to be explained and addressed by further research.

There are 53 knowledge worker teams involved in the present study and, therefore, it is comparable to other studies conducted in this research area (Barrick *et al.*, 1998; Mohammed and Angell, 2003). However, a lack of mediation effects in the present study may stem from the low statistical significance of the study, and a higher sample size would counteract this issue and increase the reliability of the data. In fact, the Cronbach alpha value of agreeableness and psychopathy traits are below the expected value of .70, and other dark triad traits, Machiavellianism and narcissism, are too close to the expected value. Having these scores in hand, the predictive power of such traits would be much higher with a larger sample size. As a result, future research may apply different personality scales with bigger sample sizes.

This study predicates the innovation-related team processes that are determined within the study conducted by Hulsheger and co-workers (2009). However, there could be some other process factors that may be conducive to innovation. For instance, recent studies in particular show that trust within teams can be a crucial determinant factor towards team creativity and innovation (Barczak, Lassk and Mulki, 2010; Newell *et al.*, 2009; Mutlu, 2015). Alternatively, team cognition, that is, a cognitive activity among members of the team that emerges through

interactions of the members in reaching shared tasks, is also considered an important predictor of team innovation. In fact, it is argued that these interactions lead teams to develop shared understandings that help members make sense of each other's technical knowledge, and thus communicate and innovate easily (He, Butler and King, 2007; Nonaka, 1994; Nonaka and Konno, 1998). Finally, the absorptive capacity of a team has recently gained the attention of some scholars with regards to its importance on innovative outcomes. The term 'absorptive capacity' was developed in a crucial paper written by Cohen and Leventhal in 1990 and, in team level, it refers to the ability of the team to recognise the value of external knowledge, and to capture and apply new types of knowledge to reach innovative ends within the organisational context (Mutlu, 2015). In fact, a growing stream of research has underscored the importance of absorptive capacity on innovation (Tsai, 2001; Lane, Koka, Pathak, Lane, and Thak, 2006). Besides, recent research has demonstrated a powerful relationship between teams' absorptive capacity and innovative performance (Nemanich, Keller, Vera, and Chin, 2010). Future investigations that focus on the role of such additional team processes between input and output factors may contribute to the conceptualisation and understanding of team innovation.

4.9. CHAPTER SUMMARY

To summarise, this study represents one of the first research endeavours investigating the interplay between personality traits, team process and team innovation in a knowledge-intensive context. Interestingly, the results are in accord with the findings of Study 1 and revealed that personality traits (including both big five and dark triad), neither directly nor indirectly through team process, determine the innovative outcome. However, the results of the second study unearthed significant associations between some of the personality traits and innovation-related team processes. What is more, the control variables also have considerable associations with

the other variables included in this study. In this regard, as a control variable gender, is revealed to be the only variable that has a direct influence on innovative outcome. Additionally, the results also indicated notable relationships between transformational leadership and innovation-related team processes in a knowledge-intensive context. The following chapter will now integrate the findings of the two studies and discuss the contribution that they make by addressing the questions of this research.

CHAPTER.5: DISCUSSION AND CONCLUSION:

Merging Two Studies

5.1 INTRODUCTION

In this research I aim to understand and investigate the role of personality composition on teams' creative and innovative performance. Thus, in the initial study, the focus was on the direct association between the big five personality traits and creative performance of student teams. Then, the focal point was extended with the following study, and the interplay between big five and dark triad personality traits, innovation related team processes and innovative performance of teams is examined through using the IPO model of innovation within a knowledge-intensive context.

5.2 THEORETICAL CONTRIBUTIONS

This thesis contributes to the organisational psychology literature. It aims to contribute to the understanding of the role of personality on team creativity and innovation. In this regard, the central objective is to improve the conceptualisation of the relationship between personality composition and team creativity in study 1, coupled with personality composition, innovation related processes and knowledge worker team innovation in study 2. To this end, this section is allocated for discussing the combined contributions of study 1 and study 2 on the team creativity and innovation literature.

5.2.1 Does the context have an influence on the relationship between personality - team creativity and innovation?

This thesis consists of 2 distinct studies that were conducted in different contexts. The first study focusses on the question of *“How does personality composition in student teams relate to the creative performance?”*

Firstly, it probes the direct influence of mean-level of big five personality traits on the creative performance, then it also investigates the moderating role of variability on the association between mean-level personality composition and creative performance of student teams. However, the results do not signify any positive or negative significant correlation between the personality variables and creative performance of teams. The first study has its limitations within the context of the module provided by the leader of the module. The main limitations were to have a relatively small sample size and a short time period to understand the influence of personality composition on team creative performance. Additionally, the first study was conducted in an artificial setting and uses only novelty measure for the assessment of creative performance of student teams.

The second study is built on the first study and addresses the most of the limitations of it. Yet, once again, the findings of this following study do not support the developed hypotheses. Furthermore, neither direct relationships between personality traits and innovative performance, nor indirect relationships between personality composition and innovative performance of knowledge worker teams through innovation related team processes were revealed as significant.

As a result, these studies were conducted in two different contexts, nevertheless, the findings of the both studies demonstrate a consistence between each other. The results of this thesis showed that, none of the personality variables do not relate to team creativity and innovation in both contexts. Therefore, at least in the scope of this study, it is difficult to mention any contextual influence on the relationship among variables that are included and examined this thesis.

5.2.2 The role of Personality on Team Creativity and Innovation

One of the main aims of this study was to understand the role of personality in different contexts, particularly the ones that include more complexity, creativity and innovation. Interestingly, both studies indicated the weak role of personality composition on teams when it comes to complex task as creativity and innovation (Litchfield et al, forthcoming). There was a possibility that the measures used in Study 1 and Study 2 are not sensitive enough to reveal considerable differences within the existing sample sizes for both studies. However, usage of the established measures and adequate reliability results indicated that most of the variables used in this research are fairly reliable. In addition, investigations with comparatively larger samples may generate significant associations between the input, process and output variables. However, it is important to mention that the studies involved in this thesis are conducted in totally distinct contexts and still there is a consistency within the results of both study. In other words, the results related to personality and team creativity and innovation are consistent with each other, and signify that personality composition as an input variable do not have an indicative magnitude on team creativity and innovation. In effect, these findings correspond to the arguments that stress the passive role of personality when it comes to complex and challenging tasks such as generating novel ideas and implementing those ideas to create new values (Newell et al, 2009). Notably, the findings of the previously conducted studies, which

investigated the impact of personality traits on creative performance of teams, also did not reveal clear significant associations (Litchfield et al, forthcoming). Therefore, research up to now has not indicated a salient positive impact of personality on the subject matter.

5.2.3 The impact of variability in personality traits on the association between mean level personality and team creative and innovative performance.

Variability in team members' personality is considered as another key influencing factor within the personality composition and team performance literature (Barrick et al, 1998; Neumann et al, 1999; Mohammed and Angell, 2003; Schilpzand et al, 2010). In this regard, this research examined the extent to which diversity in team members' personality has a moderating impact on the relationship between mean level traits and creative and innovative performance of teams.

Notably, no significant effect is observed on the strength of the association between personality traits and performance criteria in both studies. This result may be the additional explainer of the weak influence of personality on the tasks including creativity and innovation. In fact, probing the moderating role of personality diversity on the association between mean level personality and team performance, is a comprehensive approach on examining the personality and performance relationship (Peeters et al, 2006). Yet, the results on the impact of variability in personality of present research still indicate the insignificant role of personality not only on creative but also on innovative performance of teams. These findings also signify the necessity

of a qualitative research probing how and why aspects of personality particularly within the creativity and innovation oriented team contexts.

5.2.4 Do findings about personality and general performance of teams inform the influence of personality on team creativity and innovation?

As stated in the title, one of the objectives of this research is to understand the role of personality in different contexts that are creativity and innovation oriented. To this end this research tries to find an answer to the question of whether team personality profiles for routine performance are similar or different when it comes to creativity.

The published findings within the literature with regards to the personality and general performance relationship indicates the cogent role of mean-level of conscientiousness and agreeableness on general effectiveness of teams. (Barrick et al, 1998; Neuman et al, 1999; Neuman and Wright, 1999; Van Vianen and De Dreu; 2001; Peeters et al, 2006). What is more, extraversion was found to be curvilinearly related with team performance (Barry and Stewart, 1997; Neumann et al, 1999) and the investigations indicated negative association between neuroticism and team performance (Mohammed and Angell, 2003). Having these findings in hand, this thesis set out to assess the impact of personality traits when the focus is creativity and innovation in teams, and examine the informative role of team personality traits for general performance on team creativity and innovation.

However, when it comes to creativity and innovation as mentioned within the previous discussion chapters, the investigations undertaken do not reveal the personality variables as determinant input factors of team creativity and innovation (Bolin and Neumann, 2006; Baer et

al, 2008; Robert and Cheung, 2010; Schilpzand et al, 2010). In addition to these investigations, Study 1 also did not discover any significant relations between the big five personality traits and team creativity. Further, the findings of Study 2 stress the insignificant role of team personality not only on generation of new ideas in teams but also on implementation of those ideas. As a result, these findings do not correspond to the studies that probe the association between personality and general performance of teams (Barrick et al, 1998; Peeeters et al, 2006; Barry and Stewart, 1997; Mohammed and Angell, 2003). A possible explanation for this might be that complex tasks, such as creativity and innovation, involve divergent thinking and novel idea generation (Shalley, Zhou and Oldham, 2004). In addition, at team level, finding constructive solutions in order to overcome knowledge boundaries among members; developing shared understandings; and having adequate knowledge skill and abilities are important to accomplish creativity and innovation (Newell et al, 2009). In this sense, having agreeable members may help creating positive climate within the team, or including conscientious individuals may assist teams to focus on accomplishing tasks (Neumann et al, 1999). However, having these characteristics in teams may not be an answer to develop shared meanings, generating novel ideas and adapting the innovation speed of the market. Such objectives may necessitate other crucial factors, such as having related knowledge, skill and abilities, motivation, and may be task related diversity within the team (Maier et al, 2015). To this end, complex tasks as creativity and innovation may require additional factors distinct from general or routine team task requirements. Additionally, research results mostly indicate low influencing magnitude of personality variables on outcomes when it comes to complex tasks (Bolin and Neumann, 2006). This incompatibility between results related to general and complex tasks, supports the argument of team personality traits for routine performance, and are not necessarily informative about creativity efforts of teams.

5.2.5 The Relationship between Personality and Innovation Related Team Processes.

The findings of the present thesis revealed that, although personality does not have a strong influence on team creativity and innovation, it does have a relationship with innovation related team processes. This study unearthed that mean-level of agreeableness has a positive and significant relationship with team cohesion. In fact, agreeableness is the most prominent variable that is expected to be related with group cohesion (Van Vianen and De Dreu, 2001). Agreeable people referred as conflict solvers and prone to conform with others' ideas (Taggar, 2002). Therefore, the expectation is the more agreeable each member is, the more cohesive teams become. In this regard, the results of the second study addresses the expectations of scholars as well as supporting the existing findings with regards to the positive influence of agreeableness on group cohesion (Barrick et al, 1998; Van Vianen and De Dreu, 2001).

When the focus is on facilitating and cultivating communication within the knowledge worker teams, having extrovert members may assist to build a team that has adequate level of communication. In effect, extraversion is the construct that is mostly associated with communication in both individual and team level studies (Taggar, 2002; Barry and Stewart, 1997; Neumann et al, 1999; Mohammed and Angell, 2003). Therefore, arguments regarding cooperative and interactive roles of extrovert individuals are also supported by the findings of this thesis (Neumann and Wright, 1999; Molleman et al, 2004).

Additionally, the findings of this study counterintuitively showed a considerable positive impact of narcissism on team support for innovation, communication and task focus (Harms and Spain, 2015). In fact, this finding is an interesting one, and supports the positive role of narcissist individuals when the necessary conditions are in place for them. To put it another way, narcissist individuals are defined as arrogant, dominant and ego-centric, however this does not mean that members with narcissistic tendencies do not contribute to the team processes. As mentioned before, studies show that narcissist individuals may emerge as effective leaders when the conditions are chaotic and more complex (Campbell et al, 2011; Judge et al, 2002). In this sense, knowledge workers with narcissistic tendencies may see the knowledge work as a self-enhancement opportunity that contributes to their identity, and therefore supports the innovative and cooperative efforts in their teams (Alvesson and Robertson, 2006; Jakopwitz and Egan, 2005).

What is interesting in the results about personality and team processes relationships is that, extraversion has risen as the most striking and influencing personality trait with regard to the association between personality and team processes. As it can be seen in the correlation table, it has a positive influence on most of the innovation related team process, namely; team participation, support for innovation, shared objectives, task focus and team communication. These results signal the gravity of extraversion on team processes in comparison with other big five and dark triad personality traits within a knowledge-intensive R&D context (Barry and Stewart, 1997).

Figure 5.1. The Association Between Personality Traits and Team Processes



5.2.5 The Influencing Power of Transformational Leadership on Innovation Related Team Processes and Team Innovation

One of the important factors which may have an influence on the innovative performance of teams, is the leadership (West and Hirst, 2003). Hence, the latter extended study has considered transformational leadership as an important control variable that has an influencing magnitude on innovation (Karakitapulu-Aygun, Gumusluoglu, 2013; Eisenbeiss, Van Knippenberg and Boerner, 2008; Paulsen, Callon, Ayoko and Saunders, 2012). Counterintuitively, the results of the second research did not reveal any significant impact of

team leaders' transformational efforts on team innovation in a knowledge-intensive context. That said, what is striking is that this study unearthed that transformational leadership is a powerful determinant factor which is conducive to all of the innovation related team processes in knowledge-intensive contexts. This research intensify the significance of transformational leadership on team climate and processes besides contributing to the existing research that investigate the role of transformational leadership on leading knowledge worker teams (Karakitapolu-Aygun, Gumusluoglu, 2013).

All in all, coupled with the personality traits and innovation related team processes, the transformational leadership also did not reveal to be a significant influencer of the innovative performance of knowledge worker teams. Similarly, the first study also does not signify any positive relationship between personality composition and creative performance criteria of student teams. I believe this is suprising finding of the present study and the relationship definitely needs a further investigation in particular within the knowledge oriented organisations. There are two possible explanations for these findings.

The first explanation is that maybe there are other input and process factors which may have an influence on the outputs yet not included in this research. On that basis, if we consider the first study, the findings indicated the insignificant role of each personality trait on student teams' creativity, and it is known that there are other input factors widely examined by other scholars to explain the complex outcomes as creativity and innovation within the team context, for instance, team size, team tenure, job relevance and demographic diversity, knowledge, skill and ability of team members, and task complexity to name but a few (West and Anderson, 1996; Curral et al, 2001). The investigations of the scholars demonstrated that these input factors are indeed the predictors of team creativity and innovation (Hulsheger et al, 2009). To this end, personality

composition as an input factor may not be a powerful influencing input factor in complex task types that includes creativity and innovation implementation.

Moving on to the innovation related team processes, in fact there are additional team processes that are discovered by scholars whose research focus was mainly on knowledge oriented contexts. In particular, absorptive capacity of teams, trust within teams and team cognition are the most prominent processes that may be relevant to innovation in knowledge oriented organisations (Newell et al, 2009; Barton, 1998; Mutlu, 2015). To this end, the future research may examine the role of these team processes on team innovation in knowledge intensive context and compare the influencing magnitudes of the existing and additional team processes on innovative performance on knowledge worker teams. This type of effort may assist to better understand the function of team climate factors and processes on knowledge worker team innovation.

Furthermore, as in the case of innovation related team processes, other leadership styles, their roles, and influencing power on leading knowledge workers towards innovation may need to be examined. Although the transformational leadership style is the one which is mostly studied by scholars, there are studies that show the significant role of other types of leadership styles (eg. participative leadership) in knowledge-intensive context (Trevelyan, 2001; Mutlu, 2014).

The second possible explanation of these results might be about the performance measures used in both studies. Although both studies used distinct measures, they nevertheless signal the similar results in terms of outputs, and the measures used may not have adequate explaining power with the current sample size. Therefore, the coming studies in this field may examine the personality (input), team processes (process) and creativity and innovation (output) relationship

with different performance measures to shed light on the findings of this study and contribute to the existing theory.

5.3 IMPLICATIONS FOR PRACTICE

In response to high complexity and intense competition in the global environment, more and more organisations make teams the functional unit of organisations. Therefore, studies related to creativity and innovation in teamwork are crucial to provide new knowledge and suggestions to the actors of this challenging and fast-moving organisational phenomena. Research has demonstrated that developing skills for creativity and innovation is essential to gaining competitive advantage, particularly within turbulent environments. In this regard, teams are a crucial unit of organisations to generate new ideas and create new values through realisation of those ideas (Caldwell and O'reilly, 2003; Fay et al, 2015) since the collaborative nature of team work allows cross-fertilisation of knowledge, ideas and experiences which lead to creative offers and innovative outcomes (Mohrman et al, 1995; Curral et al, 2001).

Team creativity and innovation has gained the attention of some scholars, and there are investigations to understand the factors that influence teams to be innovative (West and Anderson, 1996; Zahavy and Somech, 2001; Caldwell and O'reilly, 2003; Hulsheger et al, 2009). However, this research is particularly important as its scope is on the influence of personality composition on team creativity and innovation.

What practical implications regarding the innovation management in team level arise from the findings of both studies? On combining the findings of these two research endeavours, the

common voice signals the weak role of personality composition on team outputs related to creativity and innovation. Additionally, even when we combine the findings with previous investigations within the literature, it is still difficult to talk about the clear influencing magnitude of personality on creativity and innovation in team levels (Litchfield et al, in press). As a result, when forming teams, particularly for complex tasks, such as creativity and innovation, the decision makers need to acknowledge the complicated relationship between personality and the outcomes. In this sense, alternative input factors as knowledge, skills and abilities of members, along with interdependence and complexity of team tasks, may also need to be considered by decision makers when designing creativity and innovation oriented teams.

Moreover, the findings of the second research indicated that personality traits such as extraversion, agreeableness and narcissism may have a fortifying impact on the innovation related team processes. Additionally, findings of Study 2 also demonstrated that the transformational leadership style is conducive to all team processes. I think these findings indicate the importance of alluded traits and the appropriate leadership style for the creation of innovative atmosphere within the knowledge worker teams. That said, in the latter study, it is also revealed that none of the team processes are significantly related to innovative performance of knowledge worker teams. Taking these findings together, it can be suggested that, in particular, managers of knowledge-intensive organisations may also need to consider other team process that are found to be crucial factors in knowledge-intensive contexts (Newell et al, 2009; Mutlu, 2015). In this sense, managers may enable the right conditions for team cognition within the environment in which knowledge worker teams operate (He, Butler and King, 2007). In this regard, including members who have wider intellectuality and understanding capabilities (t-shaped skills) within the teams, may enable shared cognition among knowledge workers (Leonard, 1998). Additionally, it is argued that team leaders need to ensure adequate

trust levels within the teams because it is considered and found as another crucial factor for teams to interact effectively and develop shared understandings (Jarvenpaa and Leidner, 1999; Newell, et al., 2009).

5.4 FUTURE RESEARCH

This research comprises 2 different studies that examine the role of personality on team creativity and innovation. Both studies used distinct approaches to measure the team creativity (first study) and innovation (second study). As indicated in the results, and discussions parts of the thesis, neither personality traits nor team processes emerge as influencing factors of the performance measures utilised in this thesis. In fact, there is a possibility of finding significant associations between input, process and outputs through using alternative approaches such as using more than one rater for the measurement of team creative performance or applying alternative original measures to evaluate the innovative performance of teams. Hence, future research that addresses the alternative approaches for measuring team creativity and innovation may make additional contribution for the conceptualisation of personality, team creativity and innovation relationship.

Moreover, the results of this thesis indicated that not only personality, but also team processes and even transformational leadership style, are not critical factors that have a significant relationship with creative and innovative outcomes. As hinted previously, this is an interesting finding and future research needs to confront these findings. I believe that, not only quantitative but also a comprehensive qualitative study may need to be undertaken to understand the assessor's reasons for not relating the utilised input, process or output factors with each other

and to discover the real determinants of team creativity and innovation based on the perceptions of the module leader (for the initial study) and managers of knowledge-intensive organisations (for the latter study) (Bryman and Bell, 2007).

Another important thing to remember is that, there are, in effect, other alternative input and innovation related process variables that are found to be conducive to team creativity and innovation. Heterogeneity (task related and demographic), knowledge, skill and ability of team members, task complexity, and teams size are the other input variables, and team cognition, absorptive capacity and team trust are the alternative innovation related team processes. Future investigations that consider the interaction of personality with these variables may not only shed light on to the team innovation literature, but also signalise additional research directions.

5.5 CONCLUSION

This thesis aimed to shed light on the role of personality on creativity and innovation at the team level. The conceptualisation this relationship is based on the theoretical offerings of the input-process-output framework. Through both studies, present research indicated that at the team level, personality composition may not play a determining role when it comes to complex tasks such as generating novel ideas and transforming these ideas into innovative outcomes. However, it is worth noting that the results of the second study revealed that some personality traits have considerable influence on innovation-related team processes. Within a knowledge-intensive context, such significant relationships indicate the influential role of personality traits when preparing a positive climate for innovation. Taken together, based on the results of this thesis, it is clear that personality may not be a direct influencing factor for accomplishing creativity- and innovation-related tasks at team level. In fact, the relationship might be a

complex one and may need to be considered with other factors that have an influencing power on team creativity and innovation. These additional factors may also show variation depending on the context.

To conclude, this thesis combines two studies that are consistent with each other, and therefore make useful contributions towards conceptualising and understanding the impact of personality on creativity and innovation at the team level in two distinct contexts.

APPENDICES

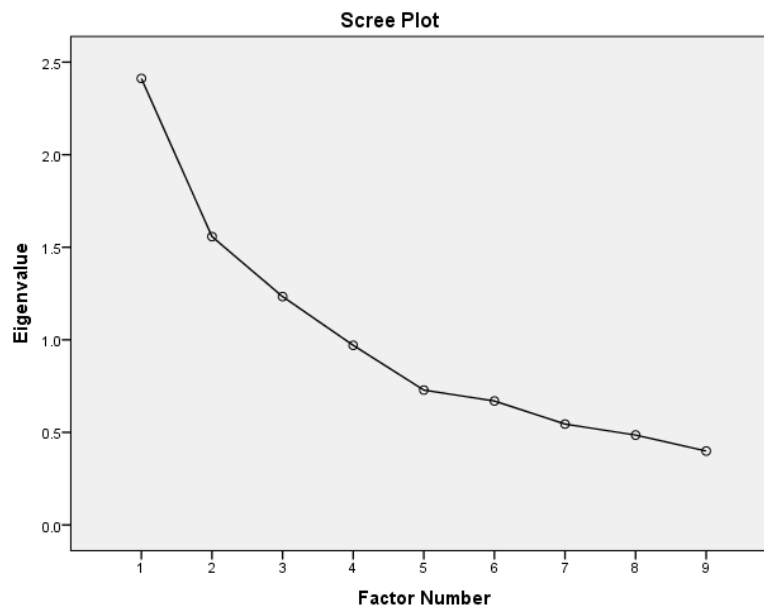
A. EXPLORATORY FACTOR ANALYSIS TABLES AND SCREE PLOTS FOR EACH PERSONALITY SCALE

A.1. STUDY ONE

A.1.1. Factor analysis for Agreeable Scale:

The scree plot (Figure 5.9) ,which is the out put of factor analysis on agreeableness scale, does not indicate a strong one factor scale. Instead signals 3 factors whose cumulative variance is 57.8% in items of agreeable scale.

Agreeableness Scale Scree Plot:



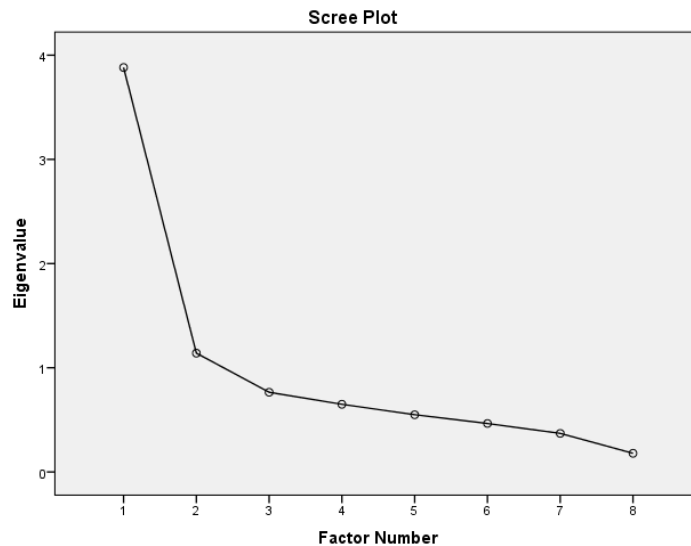
Agreeableness Scale Factor Loadings:

Agreeableness Scale Items	Factor		
	1	2	3
tends to find fault with others	-.053	-.015	.515
is helpful and unselfish with others	.039	.657	.007
starts quarrells with others	-.244	.425	.425
has a forgiving nature	.078	.364	-.014
is generally trusting	.064	.609	-.078
can be cold and aloof	.268	-.149	.460
is considerate and kind to almost everyone	.758	.161	.119
is sometimes rude to others	.207	.021	.630
likes to corporate with others	.522	.091	.019

A.1.2 Factor analysis for Extraversion Scale:

The exploratory factor analysis on extraversion scale created a scree plot and it clearly indicate one strong factor that is the extraversion as indicated in figure 5.4. Based on this scree plot there is one prevailing factor which represens extraversion. Its total interpretation of variene in responses is 48.5%. To this end, factor analysis redone on scale with 1 factor extraction and presented below.

Extraversion Scale Scree Plot:



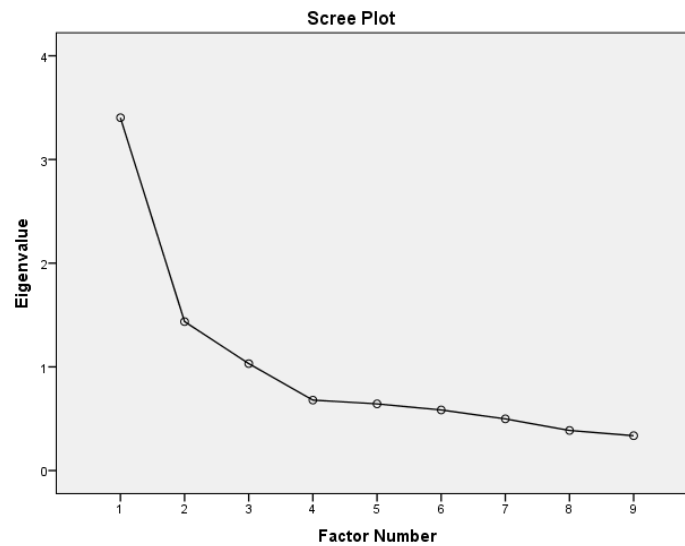
Extraversion Scale Factor Loadings

Extraversion Scale Items	Factor
	1
tends to be quiet	.872
is talkative	.716
is full of energy	.654
is sometimes shy, inhibited	.641
is reserved	.635
generates a lot of enthusiasm	.602
Is outgoing, sociable	.511
has an assertive personality	.462

A.1.3. Factor Analysis for Conscientious Scale:

The generated scree plot once again indicated a dominant 1 single factor and it refers to conscientiousness dimension. This dimension is accounted for 37.8% variance in the items. Therefore, the exploratory factor analysis redone by extracting only one factor.

Conscientiousness Scale Scree Plot:



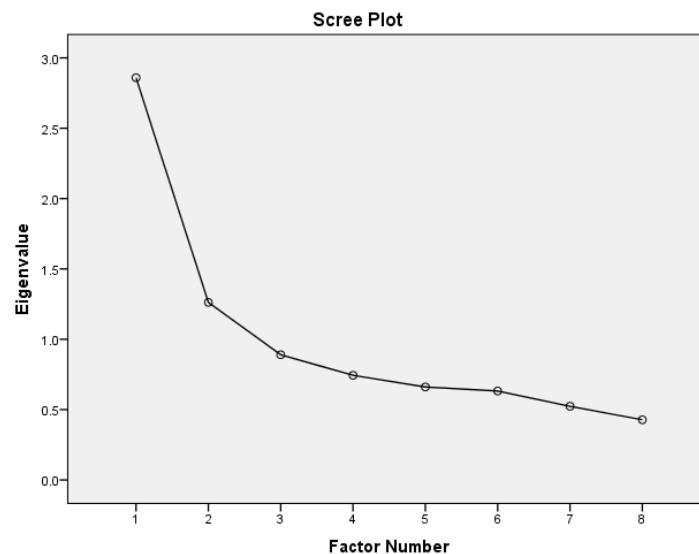
Conscientiousness Scale Factor Loadings:

Conscientiousness Scale Items	Factor
	1
tends to be lazy	.710
tends to be disorganized	.651
is easily distracted	.579
is a reliable worker	.556
does things efficiently	.536
does a thorough job	.536
can be somewhat careless	.502
makes plans and follows through with them	.421
perseveres until the task is finished	.401

A.1.4. Factor Analysis for Neuroticsm

The scree plot that is created through factor analysis on neuroticsm scale shows a significant one factor as depicted within the figure 5.6. This result was expected and the factors refers to neuroticsm. Its varience impact on items is 35.7%. As a result, based on these indications I have extracted only one factor and presented the output factor matrix below.

Neuroticsm Scale Scree Plot:



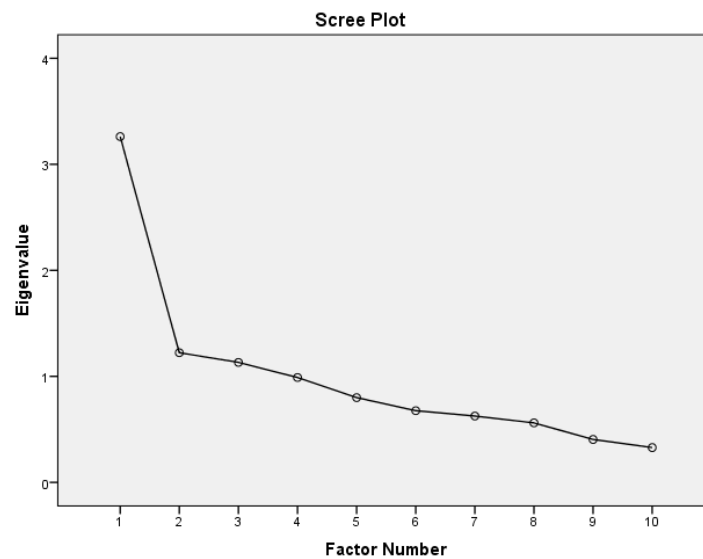
Neuroticsm Scale Factor Loadings:

Neuroticsm Scale Items	Factor
	1
is relaxed and handles stress well	.668
remains calm in tense situations	.620
worries a lot	.576
is emotionally stable, not easily upset	.522
gets nervous easily	.502
can be tense	.471
can be moody	.408
is depressed blue	

A.1.5. Factor Analysis for Openness to Experience

The final exploratory analysis on personality traits was related with openness to experience. The scree plot signifies only one clear factor for the measurement therefore the factor analysis done once again by choosing only one extract. The factor is accountable for 32.6% variance on items.

Openness Scale Scree Plot:



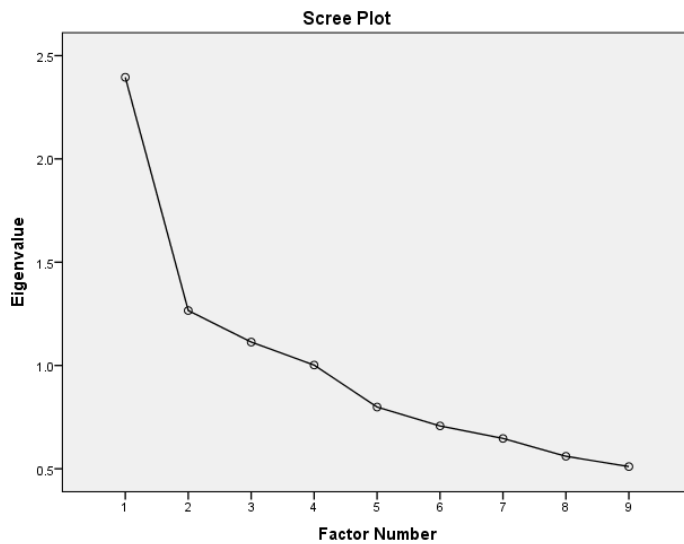
Openness Scale Factor Loadings:

Openness Scale Items	Factor
	1
is inventive	.711
has an affective imagination	.681
is original, comes up with new ideas	.627
values artistic, aesthetic experiences	.591
likes to reflect, play with ideas	.575
is curious about many different things	.429
is sophisticated in art, music or literature	
is ingenious, a deep thinker	
prefers work that is routine	
has few artistic interest	

A.2. STUDY TWO

A.2.1 Factor Analysis for Agreeableness:

Agreeableness scale scree plot:

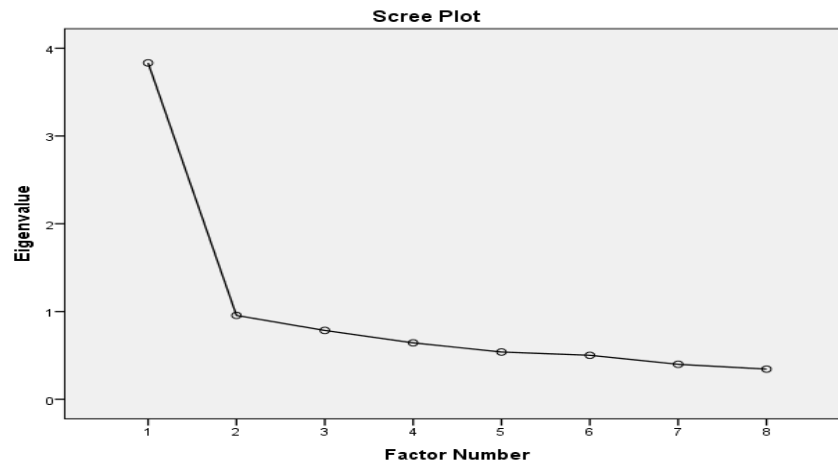


Agreeableness scale Factor Loadings:

Agreeableness Scale Items	Factor
	1
is considerate and kind to almost everyone	.624
is sometimes rude to others	.508
has a forgiving nature	.498
is generally trusting	.439
is helpful and unselfish with others	.390
tends to find fault with others	.355
can be cold and aloof	.330
likes to cooperate with others	.288
starts quarrells with others	.252

A.2.2 Factor Analysis for Extraversion:

Extraversion Scale Scree Plot:

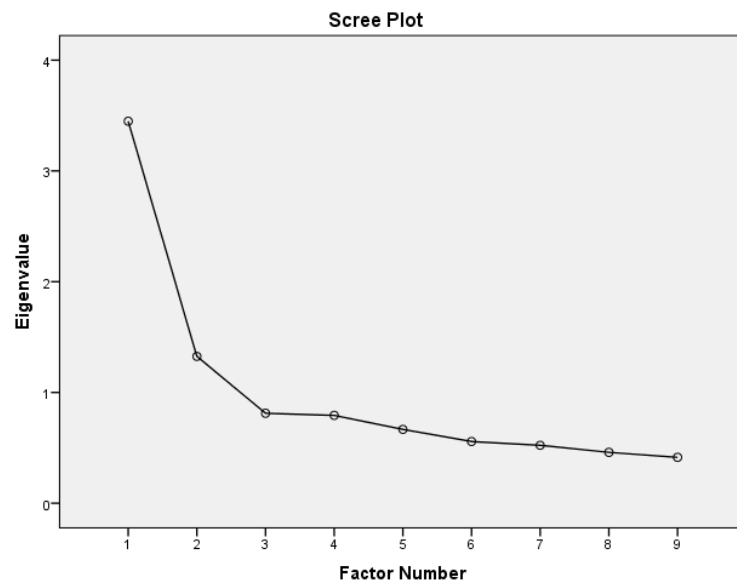


Extraversion Scale Factor Analysis Loadings:

Extraversion Scale Items	Factor
	1
tends to be quiet	.766
is reserved	.695
is talkative	.677
Is outgoing, sociable	.670
generates a lot of enthusiasm	.647
is full of energy	.611
is sometimes shy, inhibited	.528
has an assertive personality	.467

A.2.3 Factor Analysis for Conscientiousness

Conscientiousness Scale Scree Plot:

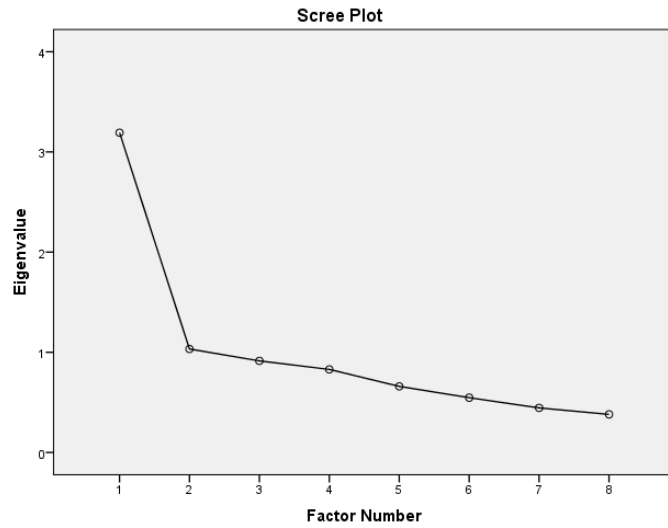


Conscientiousness Scale Items	Factor
	1
tends to be quiet	.766
is reserved	.695
is talkative	.677
Is outgoing, sociable	.670
generates a lot of enthusiasm	.647
is full of energy	.611
is sometimes shy, inhibited	.528
has an assertive personality	.467

Conscientiousness Scale Factor Loadings :

A.2.4. Factor Loadings for Neuroticism

Neuroticism Scale Scree Plot:

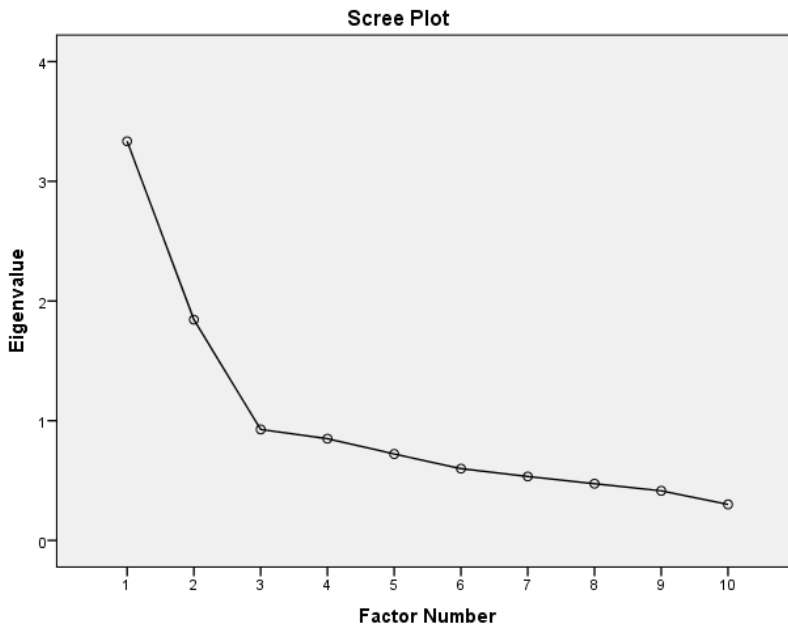


Neuroticism Scale Factor Loadings :

Neuroticism Scale Items	Factor
	1
can be moody	.697
worries a lot	.635
gets nervous easily	.617
can be tense	.593
is depressed blue	.563
remains calm in tense situations	.543
is relaxed and handles stress well	.468
is emotionally stable, not easily upset	

A.2.4. Factor Analysis for Openness to Experience

Openness Scale Scree Plot:

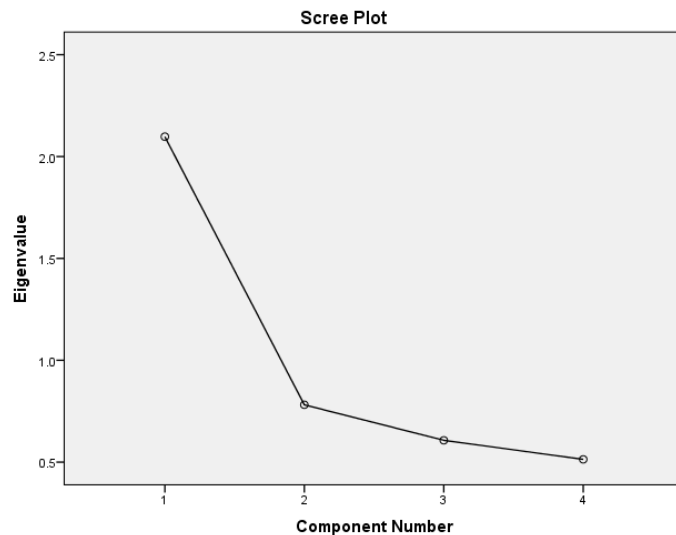


Openness Scale Factor Loadings:

Openness Scale Items	Factor
	1
is inventive	.679
is original, comes up with new ideas	.664
likes to reflect, play with ideas	.581
is curious about many different things	.569
has an affective imagination	.553
is ingenious, a deep thinker	.522
values artistic, aesthetic experiences	.427
has few artistic interest	.406
prefers work that is routine	
is sophisticated in art, music or literature	

A.2.5. Factor Analysis for Machiavellianism

Machiavellinism Scree Plot :

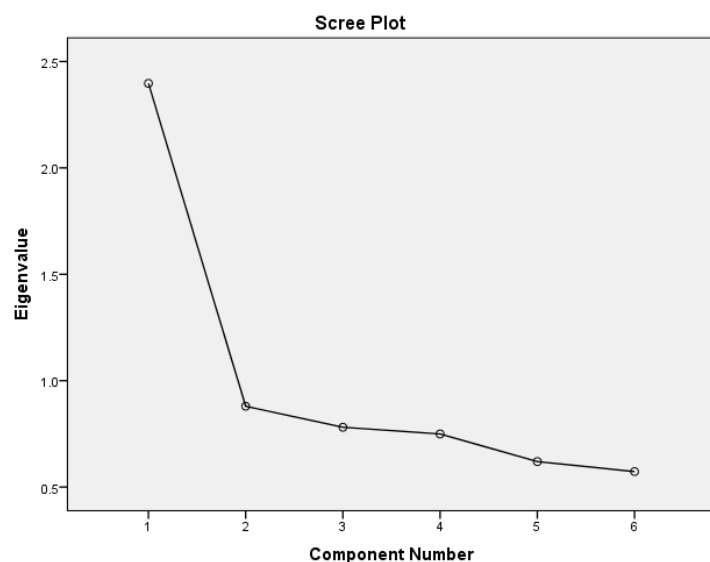


Machiavellinism Factor Loadings:

Machiavellinism Scale Items	Factor
	1
<i>Whatever it takes, you must get the important people on your side</i>	.688
<i>Make sure your plans benefit you, not others</i>	.671
<i>It's wise to keep track of information that you can use against people later</i>	.668
<i>You should wait for the right time to get back at people</i>	.599
<i>I like to use clever manipulation to get my way</i>	.593
<i>Avoid direct conflict with others because they may be useful in the future</i>	.564

A.2.6. Factor Analysis for Narcissism

Narcissism Scree Plot:

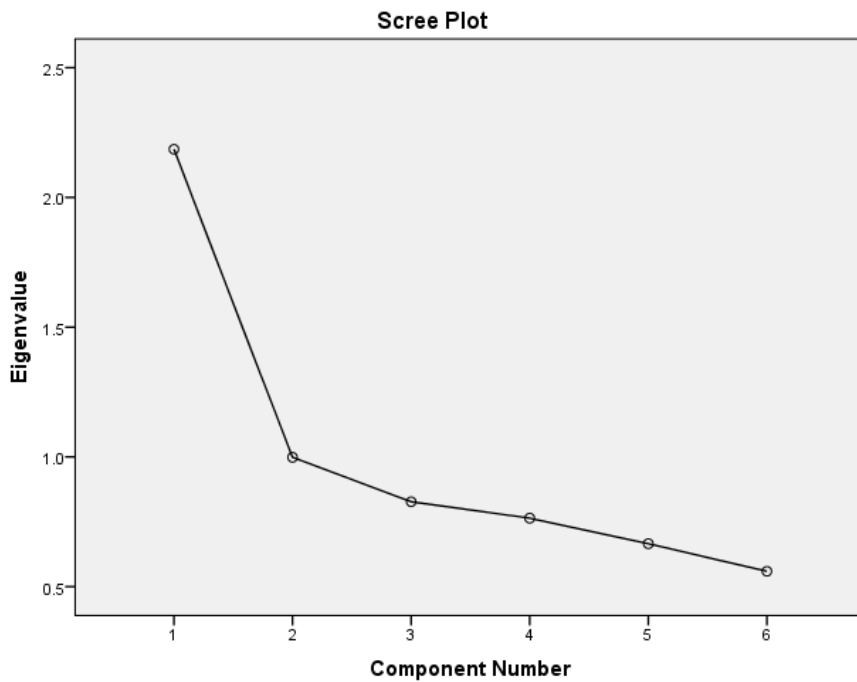


Narcissism Factor Loadings:

Narcissism Scale Items	Factor
	1
I know that I am special because everyone keeps telling me so	.785
Many group activities tend to be dull without me	.747
I have been compared to famous people	.696
People see me as a natural leader	.662

A.2.7 Factor Analysis for Psychopathy

Psychopathy Scale Scree Plot:



Psychopathy Scale Items	Factor
	1
People who mess with me always regret it	.716
You should wait for the right time to get back at peopl	.671
I like to get revenge on authorities	.622
People often say I`m out of control	.567
It`s true that I can be mean to others	.547
I will say anything to get what I want	.462

B. ETHICAL APPROVAL LETTERS

B.1. Study 1



Downloaded: 13/09/2016

Approved: 16/09/2014

Mustafa Doruk Mutlu
Registration number: 120184255
Management School
Programme: Doctoral Programme

Dear Mustafa Doruk

PROJECT TITLE: The Impact of Personality Composition on Creative Performance of Student Teams

APPLICATION: Reference Number 001654

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 16/09/2014 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 001654 (dated 21/08/2014).
- Participant information sheet 002556 version 1 (20/08/2014).
- Participant consent form 002516 version 1 (18/08/2014).

The following optional amendments were suggested:

Whilst the lecturer will be making it clear that participation is voluntary I am a little concerned that students might feel some social pressure to take part - if others in the class are doing it - and might still feel they would be viewed negatively by the lecturer - even though the lecturer has said there is no penalty for not taking part. I'm not sure how you get around that apart from emphasising this point more or give them the option to mark their questionnaire in some way - so they might complete it in front of their class mates and hand it in (so it isn't obvious that they are refusing) - but they mark their survey as not to be used?

If during the course of the project you need to [deviate significantly from the above-approved documentation](#) please inform me since written approval will be required.

Yours sincerely

Malcolm Patterson
Ethics Administrator
Management School

B.2. Study 2



The
University
Of
Sheffield.

Management School.

Sheffield University Management School

Date 28/05/2014

Dear Mustafa

PROJECT TITLE: Personality and Innovative work performance

On behalf of the Sheffield University Management School research ethics reviewers who reviewed your project I am pleased to inform you that the above-named project has been **approved** on ethics grounds

The research ethics reviewers are happy with the documentation you have provided and are happy to approve your research ethics application on this basis.

If during the course of the project you need to deviate significantly from the above-approved document please inform me since written approval will be required. Please also inform me should you decide to terminate the project prematurely.

Yours Sincerely

Harriet Godfrey
Research Manager
Sheffield University Management School

cc. Dawson (Supervisor)

C. QUESTIONNAIRES USED IN THIS RESEARCH

B.1. Student Teams Personality Measurement (Study 1):

INFORMATION ABOUT THE QUESTIONNAIRE

This questionnaire will only be used by the researcher for the aim of understanding the relationship among team personality composition, and the innovative performance of the team. It consists of 3 different sections and will last at most 10 minutes to complete.

Participation is voluntary to the study and you can withdraw any time you want until submission.

Section A: Demographic Information Scale

Age: _____

Gender: Male Female

Nationality: _____

Section B: Personality Questionnaire

Statement	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I see myself someone who...					
___ is talkative					
___ tends to find fault with others					
___ does a thorough job					
___ is depressed blue					

___is original, comes up with new ideas					
___is reserved					
___is helpful and unselfish with others					
___can be somewhat careless					
___is relaxed, handles stress well					
___is curious about many different things					
___is full of energy					
___starts quarrels with others					
___is a reliable worker					
___can be tense					
___ is ingenious, a deep thinker					
___generates a lot of enthusiasm					
___has a forgiving nature					
___tends to be disorganized					
___worries a lot					
___has an affective imagination					
___tends to be quiet					
___is generally trusting					
___Tends to be lazy					
___is emotionally stable, not easily upset					
___is inventive					
___has an assertive personality					
___can be cold and aloof					
___perseveres until the task is finished					
___ can be moody					
___vaalues artistic,aesthetic experiences					

___is sometimes shy, inhibited					
___is considerate and kind to almost everyone					
___does things efficiently					
___remains calm in tense situations					
___prefers work that is routine					
___Is outgoing, sociable					
___is sometimes rude to others					
___makes plans and follows through with them					
___gets nervous easily					
___likes to reflect, play with ideas					
___has few artistic interest					
___likes to corporate with others					
___is easily distracted					
___is sophisticated in art, music or literature					

B.2 Questionnaire for Knowledge Workers (Study 2)

STUDY ON KNOWLEDGE WORKER TEAM PERSONALITY COMPOSITION AND TEAM INNOVATIVE PERFORMANCE

INFORMATION ABOUT THE QUESTIONNAIRE

This questionnaire will only be used by the researcher for the aim of understanding the relationship among team personality composition, innovation realted team processes and the innovative performance of the team. It consists of 8 different sections and will last approximately 15 minutes. By filling in the questionnaire you consent to take part in the research under the conditions outlined in the information sheet.

Section A: Demographic Information Scale

Age: _____

Gender: Male Female

What is your highest qualification : Undergraduate Master PhD

Occupation:_____

Section B: Personality Questionnaire Part 1

Statement	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I see myself someone who...					
___is talkative					
___ tends to find fault with others					
___does a thorough job					
___is depressed blue					
___is original, comes up with new ideas					
___is reserved					
___is helpful and unselfish with others					
___can be somewhat careless					
___is relaxed, handles stress well					
___is curious about many different things					
___is full of energy					
___starts quarrels with others					
___is a reliable worker					
___can be tense					
___ is ingenious, a deep thinker					
___generates a lot of enthusiasm					

___has a forgiving nature					
___tends to be disorganized					
___worries a lot					
___has an affective imagination					
___tends to be quiet					
___is generally trusting					
___Tends to be lazy					
___is emotionally stable, not easily upset					
___is inventive					
___has an assertive personality					
___can be cold and aloof					
___perseveres until the task is finished					
___ can be moody					
___values artistic,aesthetic experiences					
___is sometimes shy, inhibited					
___is considerate and kind to almost everyone					
___does things efficiently					
___remains calm in tense situations					
___prefers work that is routine					
___Is outgoing, sociable					
___is sometimes rude to others					
___makes plans and follows through with them					
___gets nervous easily					
___likes to reflect, play with ideas					
___has few artistic interest					
___likes to cooperate with others					

___is easily distracted					
___is sophisticated in art, music or literature					

Section C: Personality Questionnaire Part 2

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
It is not wise to tell your secrets					
I like to use clever manipulation to get my way					
Whatever it takes, you must get the important people on your side					
Avoid direct conflict with others because they may be useful in the future					
It's wise to keep track of information that you can use against people later					
You should wait for the right time to get back at people					
There are things you should hide from other people because they don't need to know					
Make sure your plans benefit you, not others					
Most people can be manipulated					
People see me as a natural leader					
I hate being the center of attention					
Many group activities tend to be dull without me					
I know that I am special because everyone keeps telling me so					
I like to get accounted with important people					
I feel embarrassed if someone compliments me					

I have been compared to famous people					
I am an average person					
I insist on getting the respect I deserve					
I like to get revenge on authorities					
I avoid dangerous situations					
Payback needs to be quick and nasty					
People often say I'm out of control					
It's true that I can be mean to others					
People who mess with me always regret it					
I have never gotten into trouble with the law					
I will say anything to get what I want					

Section D: Leadership Questionnaire

The aim of this questionnaire is to measure “leadership” in a particular knowledge worker team. The test consists of 7 statements that must be rated on how much you agree with them. The test should not take most people for more than 2 minutes.

Are you the team leader:

☐ Yes ☐ No

If “no” please answer the questions below. If “yes” please go to section E.

Statement	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
Our team leader fosters trust, involvement and cooperation among team members					

Team leader treats us as individuals, supports and encourages our development					
Team leader gives encouragement and recognition to us					
Team leader communicates a clear and positive vision of the future					
Team leader encourages thinking about problems in new ways and questions assumptions					
Team leader is clear about his/her values and practices what he/she preaches					
Team leader instills pride and respect in others and inspires me by being highly competent					

Section E: Innovation Related Team Processes Scales

Cohesion in the team	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
To what extent do you agree with the following?					
People help each other in the team					
People get along in the team					
There is a personal interest in the team					
There is a lot of team spirit among team members					
There is a lot of common among team members					

Participation in the Team	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
To what extent do you agree with the following?					
We have a “we are in together” attitude					
People keep each other informed about work related issues in the team					
People feel understood and accepted by each other					
There are real attempts to share information throughout the team.					
There is a lot of give and take					
We keep in touch with each other as a team.					

Support for New Ideas	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
To what extent do you agree with the following?					
This team is always moving toward the development of new answers.					
This team is open and responsive to change.					
People in this team are always searching for fresh, new ways of looking at problems.					
Members of the team provide and share resources to help in the application of new ideas.					
Team members provide practical support for new					

ideas and their application.					

Team Objectives	Not at all		Somewhat		Completely
To what extent do you agree with the following?					
How clear are you about what your team's objectives are?					
This team is open and responsive to change.					
People in this team are always searching for fresh, new ways of looking at problems.					
Members of the team provide and share resources to help in the application of new ideas.					
Team members provide practical support for new ideas and their application.					

Task Style	Not at all		Somewhat		Completely
To what extent do you agree with the following?					
Do your team colleagues provide useful ideas and practical help to enable you to do the job to the best of your ability?					
Are team members prepared to question the basis of what the team is doing?					
Does the team critically appraise potential weaknesses in what it is doing in order to achieve the best possible outcome?					

Do members of the team build on each other's ideas in order to achieve the highest possible standards of performance?					

Internal and Externan Communication in the Team	Not at all		Somewha t		Completely
To what extent do you agree with the following?					
How frequently are there task related communication inside your team?					
How often do people in your team communicate about tasks outside your team but inside the department?					
How often do people in your team communicate with people from outside of your department?					
How often do people in your team communicate with people from outside your firm?					

Task and relationship conflict in the team	Not at all		Somewha t		Completely
To what extent do you agree with the following?					
How much friction is there among team members in your work team?					
How much are personality conflicts evident in your work group					

How much tension is there among members in your team					
How much emotional conflict is there among members in your team					
How often do people in your team disagree about opinions regarding the work being done.					
How frequently are there disagreements about your ideas in your team					
How much disagreement is there among team members about decisions made					
To what extent are there differences of professional opinion in your work team.					

B.3 Questionnaire for External Assessors (Study 2)

STUDY ON KNOWLEDGE WORKER TEAM PERSONALITY COMPOSITION AND TEAM INNOVATIVE PERFORMANCE

By filling in the questionnaire you consent to take part in the research under the conditions outlined in the information sheet.

Section A: Demographic Information Scale

Age: _____

Gender: Male Female

Grade Level: Undergraduate Master PhD

Occupation: _____

How long have you been working in this organisation? _____ Years.

Section B: Team Innovative Performance Assessment Scale

This questionnaire will only be used by the researcher for the aim of understanding the relationship among team personality composition, innovation related team processes and the innovative performance of the team. The aim of this questionnaire is to measure innovative performance of the particular team and participation to the study is voluntary. The test consists of 6 statements that must be rated on how much you agree with them. The test should not take most people for more than five minutes.

Please provide the name of the team you are assessing: _____

Statement Related to Team Innovative Performance	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
The team initiated new procedures and methods in the last month.					
The team developed new skills in order to foster innovations in the last month.					
The team developed innovative ways of accomplishing work targets/objectives in the last month.					

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