EXAMINING CAUSAL EFFECTS OF EMOTIONAL INTELLIGENCE ON HUMAN RELATED CHALLENGES OCCURING IN AGILE MANAGED INFORMATION SYSTEMS PROJECTS

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Examining causal effects of Emotional Intelligence on human related challenges occurring in Agile managed Information Systems projects.

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ABSTRACT

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Keywords: agile, information systems, project management, emotional intelligence

Agile project management has become a widely implemented project management approach in Information Systems (IS). Yet, along with its growing popularity, the amount of concerns raised in regard to human related challenges is rapidly increasing. Nevertheless, the extant scholarly literature has neglected to identify the primary origins and reasons of these challenges. The purpose of this study is therefore to examine if these challenges are caused by a lack of Emotional Intelligence (EI) by means of a quantitative approach, which includes two main steps. Firstly, based on a sample of 447 IS-professionals, the psychometric properties of their EI in regard to their personal characteristics is examined. Secondly, based on the findings of the first analysis, the causal inference of EI on these challenges is computed using Propensity Score Matching based on a second sample of 194 agile practitioners. Different dimensions of EI were found to have a low to medium impact on human related challenges occurring in agile teams in regard to anxiety, motivation, mutual trust and communication competence. Hence,

these findings offer important new knowledge for IS-scholars, project managers and human resource practitioners, about the vital role of EI for educating, staffing and training of IS-professionals working in agile teams.

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ABBREVIATIONS

AI	Artificial Intelligence
AEI	Artificial Emotional Intelligence
ANX	Anxiety
ATE	Average Treatment Effect
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CSF	Critical Success Factor
COM	Communication
EFA	Exploratory Factor Analysis
EI	Emotional Intelligence
EQ-i	Emotional Quotient Inventory
EVO	Evolutionary Value Delivery
GMA	General Mental Ability
HRACI	Human Related Agile Challenges Inventory
IS	Information Services
MOT	Motivation
MSCEIT	Mayer-Salovey-Caruso Emotional Intelligence Test
NEO-PI-R	Revised Neuroticism-Extraversion-Openness Personality Inventory
OEA	Appraisal and recognition of emotion in others
PM	Project Management
PSM	Propensity Score Matching
RAD	Rapid-application development
RCM	Rubin's' Causal Model
RMSEA	Root mean square error or approximation
ROE	Regulation of emotion in oneself
SEA	Appraisal and expression of emotion in oneself
SPCC	Self-Perceived Communication Competence Scale
SREIS	Self-Rated Emotional Intelligence Scale
TLI	Tucker Lewis Index
TRU	Trust
UOE	Use of emotion to facilitate performance
WLEIS	Wong and Law Emotional Intelligence Scale
WLEIS-I	Wong and Law Emotional Intelligence Scale Italian version
XP	Extreme Programming
$\chi 2$ / df	Ratio of Chi-square and Degree of Freedom

1. CHAPTER 1: INTRODUCTION

1.1. Introduction

This chapter begins with introducing the research background and context. In particular, it illustrates the rise of agile project management methodologies in order to replace traditional plan-driven project management methodologies. The chapter continues discussing the positive effects of Emotional Intelligence on job performance and why Emotional Intelligence might also be related to agile methods. Then, the research gap is identified and the rationale for this research is presented. This is followed by illustrating the research aim, question and objectives. Finally, the significance of this research is presented.

This chapter is structured as follows. Section 1.2 presents the research background and context. This is followed by the research rationale in section 1.3 and the research aims, question and objectives in section 1.4. In section 1.5 the significance of this research is described. Then in section 1.6, the thesis outline is illustrated. Finally, chapter 1.7 summarizes the overall chapter.

1.2. Research Background and Context

Information systems (IS) provide many benefits for organizations, such as improved profitability and organizational performance, as well as more efficient and effective business processes (Dwivedi et al., 2015). Yet, the implementation of IS can be a considerably complex project, which can easily take several years and span teams worldwide (Ebert and Paasivaara, 2017). Consequently, when IS implementations fail, this can lead to huge financial losses for organizations, such as reported by Dwivedi et al. (2015), when a garbage-disposal firm waste management is embroiled in a $100 million

legal battle against a software provider over an 18-month implementation of its management software. Business organizations have thus realized that to remain competitive, it is critical to develop project management methodologies as a core competency (Haniff and Salama, 2016).

1.2.1. The Rise of Agile Project Management

Traditional software project management methodologies, such as Waterfall, have been used by software companies as the primary software development process for many years (Javdani Gandomani and Ziaei Nafchi, 2016). Though, they have attracted a number of criticism, such as being too linear, too rigid, and too planned and thus are not suitable to manage innovative and dynamic projects (Cooper, 2014). Being confronted with increasing problem complexity and rapid changing requirements, software developers hence started to realize that an alternative project management approach is needed (Kakar, 2017). As response to these traditional methods, agile project management methods emerged in the late 1990s (Hoda et al., 2018). The agile philosophy emphasized a context in which resources are scarce and requirements volatility is high (Holvitie et al., 2018). The rise of agile project management started to get significant attention with the publication of the Agile Manifesto in 2001 by seventeen professionals who wanted to define new values for better software development (Hohl et al., 2018). The Agile Manifesto was ruled on four main values and twelve underlying principles, oriented around team interaction, the creation of working software instead of full documentation, collaboration with customers and responding to change instead of following a plan (Azanha et al., 2017, Cram, 2019). Hence, agile project management has been characterized with different labels, such as being flexible, adaptive, iterative and extreme or lean (Azanha et al., 2017).

Since the introduction of agile, organizations have been captivated by its potential to engage stakeholders, adapt to changing requirements and quickly deliver software (Cram, 2019). Consequently, agile has become a major software engineering discipline in both, practice and research and is now the mainstream software development method of choice worldwide (Ebert and Paasivaara, 2017, Hoda et al., 2018). According to a recent study conducted by VersionOne (2018), 97% of the respondents' organizations practice agile development methods and 52% of them stated that more than half of their teams are using agile practices.

The transformation to agile has been one of the major management shifts in software development in the last 15 years (Thorgren and Caiman, 2019). Agile methods have transformed the way software is develop by emphasizing active end-user involvement, tolerance to change, and evolutionary delivery of products (Dingsoeyr et al., 2019). Yet, successfully adopting and using agile methods within an organization is challenging (Gregory et al., 2016), because agile places human effort and experience at its core through its central focus on people and interactions (Hoda et al., 2018). Consequently, agile practitioners have reported instances of initial confusion, resistance or uncertainty related to the agile adoption (Cram, 2019). Since the introduction of agile almost two decades ago, the importance of the people factor has therefore been repeatedly highlighted in the scholarly literature (e.g. Cockburn and Highsmith (2001), Boehm and Turner (2005), Radujković et al. (2014), Kalenda et al. (2018)). The people factor is becoming even more apparent as large organizations often have big projects executed by large and distributed development teams, requiring agile to be scaled (Paasivaara et al., 2018). Yet, scaling agile in large organizations is complex and therefore prone to challenges when development teams need to synchronize their activities (Dikert et al.,

2016), such as communication issues, a lack of flexibility and coordination challenges (Ebert and Paasivaara, 2017, Kalenda et al., 2018, Conboy and Carroll, 2019) or a lack of readiness and appetite for change (Dikert et al., 2016, Conboy and Carroll, 2019, Paasivaara et al., 2018). As a result, becoming agile continues to be a daunting journey for many software developers (Hoda and Noble, 2017).

Whenever team members interact and work together, emotions grow out of social interactions and thus emotions have a pervasive influence in establishing a collaborative environment, where team members are encouraged to embrace change and to openly share and discuss their individual viewpoints, share knowledge and learn from each other (Barczak et al., 2010). Hence, the focus on emotions within organizations have gained and sustained attention (Speights et al., 2019).

1.2.2. Emotional Intelligence as Premise for Job Performance

Emotional Intelligence has been associated to many important aspects of job performance, such as team functioning, leadership effectiveness and improved communication (Ciarrochi and Mayer, 2013) or effective performance in domains such as enhanced project management, customer service or work teams (Mattingly and Kraiger, 2019). The positive effects of EI on job performance has therefore been repeatedly recognized in the scholarly literature (e.g. Wong and Law (2002), Law et al. (2008), Brunetto et al. (2012), Trivellas et al. (2013), Chen et al. (2015)). This is why most executives have now accepted that EI is as critical as IQ to an individual's effectiveness and EI is now considered as widely accepted assessment tool for hiring, training, leadership development and team building (Joseph et al., 2015). Furthermore, human

resource practitioners started to place value in selecting and training a more emotional intelligent workforce (Mattingly and Kraiger, 2019).

On the surface, it appears that EI is not relevant for IS-professionals, as their work is of technical nature. Yet, although this is true, they do not work alone (Lee et al., 2017). On contrary, EI abilities might also be particular useful for IS-professionals working in agile teams. For example, as illustrated by Law et al. (2008), the ability to regulate emotions in one's self is crucial when being confronted with impolite behavior from customers or uncooperative behavior from peers. Employees high in this ability can rise above these unavoidable negative emotional impacts quickly and therefore their performance would suffer less from the adverse situation. Another notable example has been illustrated by Côté (2017), who shed light on how managers can leverage EI in a variety of situations, such as performance review, tense negotiations with clients or the implementation of change. In a related study, Kaufmann and Wagner (2017) examined cross-functional teams and their findings suggested that aggregated EI of team members is a critical factor and positively related to team performance. They argued that a team, consisting of many emotional intelligent team members has a higher team cohesion, i.e. that strong interpersonal bonds exists between the team members. This higher team cohesion then results in higher motivation to perform well.

Yet, despite of emerging evidence about the positive impact of EI on job performance (Law et al., 2008, Kosti et al., 2014, Chen et al., 2015, Maqbool et al., 2017), Kosti et al. (2014) and Lee et al. (2017) criticized that there has been only little research done that focusses on EI of IS-professionals. Therefore, Kosti et al. (2014) examined EI of Swedish software engineering students to investigate the connections between EI and work

preferences. Their findings showed that students of higher levels of EI prefer to be responsible for the entire development process rather than just a task of it and in addition also prefer to prioritize their own tasks. A similar study by Ahmad Marzuki et al. (2015) based on Malaysian students found that students with high EI will have better command in communication skills and information technology skills. In a related study, Lee et al. (2017) examined EI of IS-professionals and their results indicated that EI is positively related to personal accomplishment and job satisfaction. Moreover, a very recent related study conducted by Rezvani and Khosravi (2019) investigated the impact of EI on perceived stress and trust among 368 Australian software developers. Their results indicated that EI mitigates stress and fosters trust among software developers working on IS-projects. These studies provided preliminary evidence that EI plays an important role in successfully delivering software development projects.

However, software projects can be managed with different approaches, such as plan-driven or agile, with agile becoming the predominant project management approach in software development (Cram, 2019). Yet, academic studies in agile software development methodologies are largely missing out on the implications for the individual developer's way of working, such as potential negative consequences for developers, who have to cope with multiple draining demands in their daily work (Fortmann, 2018).

1.3. Research Rationale

Despite of several studies highlighting human-related challenges as major challenges when applying agile, exploring the primary origins and reasons of these challenges has received less effort in a large-scale research study (Javdani Gandomani and Ziaei Nafchi, 2016). In particular, research on human aspects in software engineering is still

underrepresented with only less than 5 percent of papers published in the area of software engineering and development (Lenberg et al., 2015). In the same vein, Hoda et al. (2018) stated that human and social aspects only play a minor role in agile research compared to the most significant research areas, such as agile practices, agile and usability and agile and global software engineering. Though, in order to arrive at a more realistic understanding of the people involved in software development, more research on multiple scientific disciplines, such as social and organizational science as well as psychology is required (Lenberg et al., 2015).

Lalsing et al. (2012) once stated that agile looks great on paper, but will fail to succeed in reality, if human psychology is not understood and taken into account. If human aspects are neglected, there is a risk that results are produced that do not uncover key factors for determining the success or failure of software projects (Lenberg et al., 2015). Though, as stated by Rezvani and Khosravi (2019), prior research has focused primarily on the technical skills of software developers on project outcome and overlooked developers' social and emotional skills. As a consequence, the study of psychological aspects in agile development remains a quite new research field (Thorgren and Caiman, 2019). However, with agile becoming the dominant project management approach in IS (VersionOne, 2018) and growing evidence about human-centric challenges in agile teams as illustrated above, there is a need to better comprehend the Emotional Intelligence of IS-professionals and its causal inferences with human related challenges occurring in agile managed software development projects

1.4. Research Aim, Question and Objectives

The aim of this study is to assess the impact of Emotional Intelligence on human related challenges occurring in agile teams. The research question it endeavours to answer is:

Are human related challenges that IS-professionals perceive when working in agile managed teams caused by a lack of Emotional Intelligence?

This research question is investigated by pursuing following research objectives:

1. To critically review the current literature to identify human related challenges perceived by IS-professional when working in agile teams and to critically review existing models of EI and their corresponding assessment tools.

2. To design the Human Related Agile Challenges Indicator (HRACI), as a tool to measure human related challenges occurring in agile teams.

3. To analyse the impact of the individual characteristics of agile team members in order to understand their impact on EI.

4. To define a conceptual model in order to empirically test, analyse and discuss the impact of EI on the human related challenges occurring in agile teams.

5. To provide recommendations and conclusions to human resource practitioners and project managers how to staff and train agile teams.

1.5. Significance of the Research

This study contributes to psychology and human resources research. It provides an in depth analysis of the psychometric properties of IS-professionals' EI by examining how it is influenced by their individual characteristics: gender, age and cultural background. It also supports existing evidence that EI can be increased by EI-training. Furthermore, this study also contributes to information systems and project management. It introduces EI as so far neglected critical success factor to the agile project management literature. Hence, the findings of this study highlight the importance to consider EI when educating, staffing and training IS-professionals who seek to work in agile teams.

1.6. Thesis Outline

The remainder of this paper is organized in five chapters, which are summarized below.

Chapter 1: Introduction

The first chapter introduces the research background and context. It identifies the gap and presents the research rationale. This is followed by illustrating the research aim, research questions and objectives and the significance of this research.

Chapter 2: Literature Review and Hypotheses Development

Chapter 2 presents the literature review. The literature review starts with contrasting traditional and agile project management methodologies. When different concepts and models of EI are discussed. This is followed by an overview of different EI assessment tools. Finally, the Wong and Law Emotional Intelligence Scale is discussed in detail, by highlighting its proven psychometric properties and construct validity.

Then the chapter reviews the challenges perceived by agile team members reported in the scholarly literature. The identified challenges are then associated to EI in order to develop the hypotheses and proposed conceptual model.

Chapter 3: Research Methodology

This chapter starts with outlining the ontological and epistemological considerations. Then the research design, including the research purpose, research strategy and stages of the research process are described. This is followed by a justification, why quantitative research has been selected as appropriate research methodology. Furthermore, this chapter also illustrates how the applied questionnaire has been developed and validated. By means of this questionnaire two samples have been retrieved. The properties of both samples are presented. Finally, Propensity Score Matching as statistical method to indicate causal inference in observational studies is discussed.

Chapter 4: Data Analysis and Discussion

Chapter 4 includes the data analysis and the discussion of this research for both samples. It is therefore divided into two main sections: study 1 and study 2. Study 1 examined the Emotional Intelligence of IS-professionals based on the first sample. Psychometric properties of Emotional Intelligence, such as gender, age or cultural background are discussed and compared to similar samples collected by other researchers. Study 2 examined the human related challenges based on the second sample. The proposed hypotheses were verified and where applicable the Average Treatment Effects of EI on the perceived challenges were computed. As a result, the revised conceptual model is presented and discussed.

Chapter 5: Limitations, Conclusion, Contribution and Future Directions

This chapter starts with outlining the limitations of this study. Then it summarizes the findings and provides the conclusions of this research. The findings of this study provide strong evidence that EI is a root cause for the human related challenges that agile practitioners perceive. Furthermore, the contributions to theory and practice are presented. As far as the researcher's knowledge, this research is the first attempt to examine to which extend the EI of IS-professionals is associated to human related challenges they perceive when working in agile teams. Finally, future research directions are outlined.

1.7. Chapter Summary

This chapter provided an overview of the research background and context by highlighting the importance of IS for organizations. The success of IS implementations is closely related to the way they are managed, i.e. by selecting the appropriate project management methodology. As traditional plan-driven project management methodologies struggle to successful deliver dynamic projects, agile project management methodologies are gaining increasing acceptance in software development, as they are more flexible in coping with changing customer demands. Yet, an increasing body of literature has reported human related challenges perceived by agile team members. This research aims to examine if these challenges might be caused by a lack of their EI. It posits that if this association is understood, it can assist project managers and human resources specialists in staffing and training of agile teams.

2. CHAPTER 2: LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. Introduction

Chapter 1 has outlined the research background and explained the objectives of this research. Chapter 2 presents the literature review. It starts with a comparison between plan-driven and agile project management methodologies. This is followed by a discussion about negative characteristics exhibit by IS-professionals and why these characteristics are in contrast to the required skillset of agile practices. Research has indicated that these required skills are related to Emotional Intelligence. The chapter therefore continues with introducing various conceptualizations and models of Emotional Intelligence. Afterwards, it is discussed that the research area of Artificial Intelligence can only continue to progress if also the research on Emotional Intelligence progresses and then the negative effects of EI are discussed. This is followed by a comparison of existing assessment tools for EI. The Wong and Law Emotional Intelligence Scale is then discussed in more detail, as it has been selected as the most suitable tool to assess the EI of IS professionals for this research. Afterwards the literature review continues with a focus on human related challenges that occur in agile teams. The identified challenges are then associated with EI in order to arrive at the proposed hypothesis and conceptual model.

The literature review is structured as follows. In section 2.2 plan-driven and agile project management methodologies are contrasted. This section also includes a discussion why agile methodologies are human centric and therefore require more than technically skilled professionals. In section 2.3 different conceptualizations and models of Emotional Intelligence are discussed and in section 2.4 an overview of the available assessment

tools for EI is presented. The proposed hypothesis and conceptual model are presented in section 2.5. The chapter closes with an overview of the overall chapter in section 2.6.

2.2. Project Management

The history of Project Management (PM) in general is relatively short in comparison to other sciences and it was not until the 1950s that organizations, e.g. the U.S. Navy, realized that complex projects have to be addressed in a systematic way in order to succeed (Seymour and Hussein, 2014). The awareness for the need to professional manage big “undertakings” also arose in other organizations, e.g. with the development of major weapon systems by the U.S. department of Defense or space mission conducted by NASA (Dinsmore et al., 2010). Yet, nowadays, projects are a frequent activity in organizations which drives substantial resources to drive innovation and changes (Ahimbisibwe et al., 2017). A notable definition has been introduced by The Project Management Institute (PMI, 2013), who defines Project Management as the application of knowledge, skills, tools and techniques to project activities to meet the project requirements.

In the literature a number of different project management methodologies can be found, e.g. Waterfall model, Spiral model, Prototype model, SCRUM or Evolutionary Value Delivery (EVO) (Mandal and Pal, 2015). Based on their characteristics, these methodologies can be grouped into two opposing approaches: plan-driven and agile.

2.2.1. PLAN-DRIVEN METHODOLOGIES

The first project management approaches are based on business theories that were first used in the manufacturing and construction industries in the early 19th century (Davis et al., 2013). At that time projects were perceived as relatively simple, predictable and linear, so that a detailed project plan could be created in advanced and then executed without major changes (Radujković et al., 2014). Early project management methodologies are thus driven by a project plan, which includes predefined project stages (Cooper, 2014). These stages are then executed sequentially, whereas each stage is only executed once (Robson, 2013). Consequently, these approaches are referred to as plan-driven project management methodologies (Goodpasture, 2010). As they have been used for more than a decade, they are nowadays also referred to as traditional project management methodologies (Serrador and Pinto, 2015).The correspondent model used in IS-Projects is referred to as waterfall-model (Cooper and Sommer, 2016). It is called waterfall-model because the model develops downward, from one state to another and there is no way to turn back to a prior phase, once the last one has been reached (Pedersen, 2013). Other plan-driven models include Spiral or RAD model (Mandal and Pal, 2015).

As illustrated by Andrei et al. (2019) in plan-driven approaches, the project is split into multiple fixed phases as shown in Figure 1:

- Requirements: analysing business needs and extensive documentation of all features
- Design: choosing all required technology and planning the full software infrastructure and integration
- Coding: building the solution by implementing each feature described in the requirement phase

- Testing: extensive testing of all implemented features and solving any occurring issues
- Operations: deployment to a productive environment

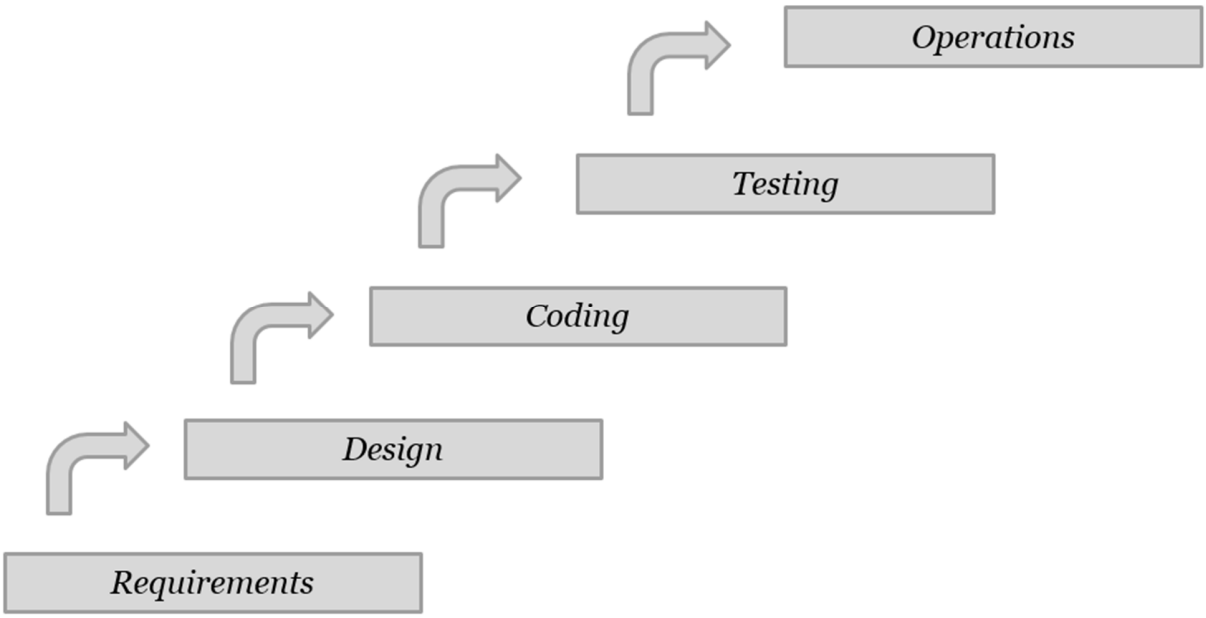

Figure 1 Projects Phases in Plan-driven approach (adopted from Andrei et al. (2019))

Many authors have alluded on the pitfalls of plan-driven approaches. The main concern is that they assume that projects exist isolated from their environment and their emphasize on robustness of the plan has thus been criticized to not properly respond to the increasing complexity and dynamic of today's projects (Radujković et al., 2014, Cooper, 2014). In particular, plan-driven approaches assume that the initial requirements do not change once defined, but in most real-life cases customers can change their opinion towards different features or even continue to add requirements and as a result some, if not all phases have to be evaluated (Pedersen, 2013, Andrei et al., 2019). Also other drawbacks have been reported, such as that too much time is wasted with documentation and client

collaboration starts too late (Mandal and Pal, 2015) or often too much time is spent on critical tasks and as a result leading the project progress to lag behind and end up with a long list of unfinished tasks at the end of the project (Kisielnicki and Misiak, 2017). As a consequence, plan-driven project management methodologies have therefore been characterized by their reliance on written documentation, extensive front-up planning, up-front customer involvement and a more formal, command-and-control oriented management structure (Cram, 2019).

Yet, the current competition in the market is forcing organizations to respond and adjust their processes quickly in order to drive their projects to remain competitive, i.e. when the projects are embedded in business environments where uncertainties and constant changes are present (Azanha et al., 2017). To overcome the pitfalls of these traditional approaches new more flexible methodologies were introduces, such as the agile methodologies.

2.2.2. AGILE PHILOSOPHY AND PRACTICES

Agile emerged during the 1990s as a software development methodology, gathering momentum as a more responsive and collaborative approach compared to development with traditional plan-driven approaches (Birkinshaw, 2019). As a result, in 2001 a group of 17 IS-practitioners, who questioned the traditional PM approaches, formed the Agile Alliance and defined the “Manifesto for Agile Software Development” which included these four key values (Azanha et al., 2017):

Individuals and interaction over processes and tools

Working software over comprehensive documentation

Customer collaboration over contract negotiation

Responding to change over following a plan

Since then agile methodologies have transformed the way software is developed, emphasizing active end-user involvement, tolerance to change, and evolutionary delivery of products (Dingsoeyr et al., 2019). Therefore, agile methodologies have been widely employed in organizations and found to yield positive results, such as agility, adaptability, and speed to development projects (Cooper and Sommer, 2016).

With agile, responding to change is more important than following a plan and change is therefore seen as an asset rather than as a liability (Thorgren and Caiman, 2019). Thus, instead of being driven by a sequential plan, agile applies an iterative process, where in each iteration, the team plans, analyzes, designs, codes, and tests to achieve defined goals as illustrated in Figure 2 (Kisielnicki and Misiak, 2017, Thorgren and Caiman, 2019). These agile methodologies have been labeled with different names, such as XP, scrum, Crystal or EVO (Dingsoeyr et al., 2019). The agile methodology that is considered as most popular is SCRUM (Canty, 2016, VersionOne, 2018, Dingsoeyr et al., 2019). Yet, in recent years, organizations also started to integrate different agile-oriented methodologies together, such as SCRUM-XP, as well as mixing agile and plan-driven methodologies, e.g. Water-SCRUM-fall (Cram, 2019).

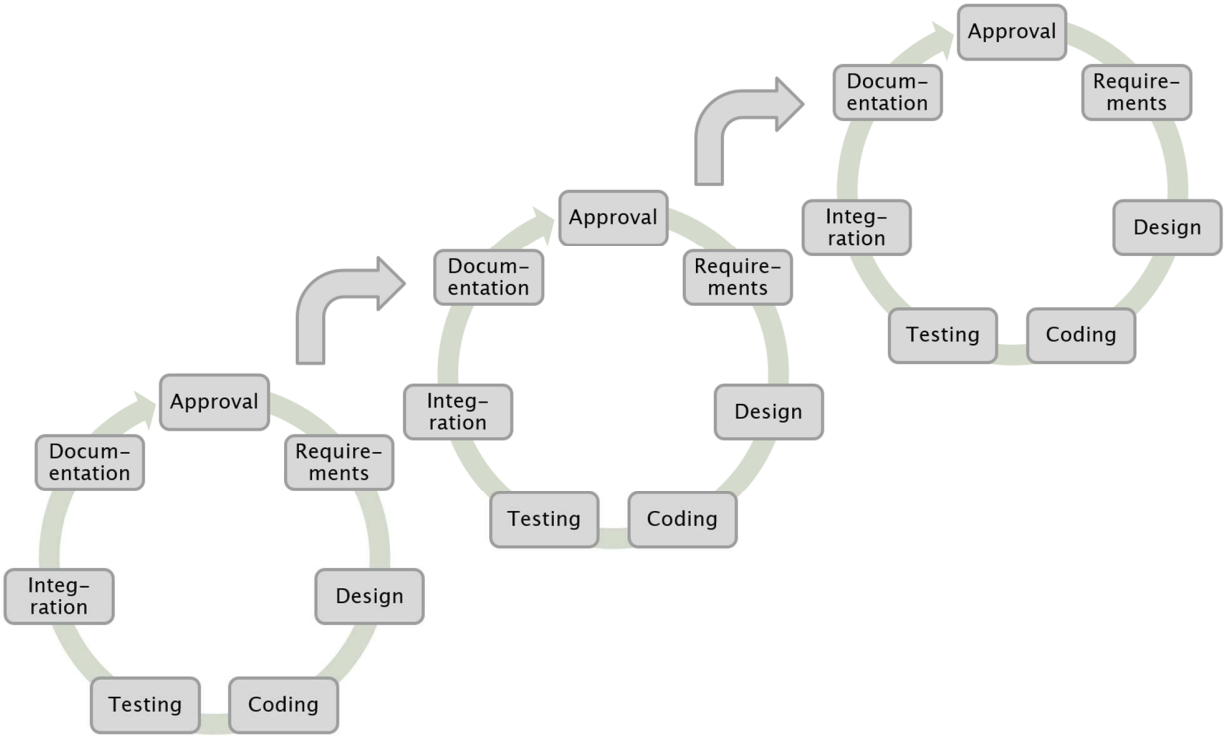

Figure 2 Process steps in Agile approaches, e.g. SCRUM (adopted from Andrei et al. (2019))

Corresponding with the key values of the agile philosophy, a series of core agile practices have been established and are presented in Table 1 (Cram, 2019).

Table 1 Agile Practices (adopted from Cram (2019))

#	Core agile practice	Practice definition
1	Acceptance of design changes	Throughout the development process, stakeholder design change suggestions should be encouraged and accepted.
2	Minimum planning and documentation	The use of up-front planning and written documentation should be kept to a minimum.

3	Retrospectives	At the conclusion of each project iteration/sprint, the team gathers to discuss what went well and what could be improved in the future.
4	Pair-programming	Two developers working together on a shared programming task at a single workstation.
5	Stand-up meetings	Short meetings, facilitated while participants are standing, that aim to coordinate activities and resolve key issues.
6	Frequent releases	The periodic (e.g., every two weeks) completion and release of working code.
7	Self-directed, autonomous teams	Development teams are empowered to decide upon the roles and responsibilities of its members during the project.
8	On-site customer participation	Stakeholders representing the customer of the product being developed play an active, in-person role during the project.
9	Collective code ownership	No one on the project team has sole control over any code and changes are permitted to be made by any team member.
10	Open-plan workspaces	Project teams work in open, shared environments.

Along with its successful dispersion agile has attracted considerable interest in academic research. In the early days of agile research around twenty years ago, the focus was on exploring the fundamental agile concepts, such as agile methods, agile adoption, agile

practices or human and social aspects (Hoda et al., 2018). Then organizations realized that industry-scale software development often can easily take several years and span teams worldwide and therefore the workload is too much work for a single team (Ebert and Paasivaara, 2017). Yet, as these projects are too complex it is deemed inefficient or impractical to split development into small projects and thus demands agile practices to be scalable (Dingsoeyr et al., 2019). Yet, agile has originally been designed to cater for single teams of five to nine developers (Dingsoeyr et al., 2019). Therefore, scaling agile in large organizations is complex and therefore prone to challenges such as communication issues, a lack of flexibility and coordination challenges (Ebert and Paasivaara, 2017, Kalenda et al., 2018, Conboy and Carroll, 2019) or a lack of readiness and appetite for change (Conboy and Carroll, 2019). As a result, scaling agile is currently among the most relevant research topics (Kalenda et al., 2018, Hoda et al., 2018) and scholars have introduced large-scale agile development frameworks such as Scaled Agile Framework, Large-Scale Scrum, Spotify, Nexus or Scrum at Scale to overcome these challenges (Ebert and Paasivaara, 2017, Conboy and Carroll, 2019). Other future trends of agile include its integration with User eXperience Design (Da Silva et al., 2018), AI-based software engineering and how it can fulfil the demands of the Internet of Things industry (Hoda et al., 2018) or agile tailoring, that is to decide which agile practices to include or exclude to suit a certain software project (Cram, 2019).

2.2.3. AGILE IS NOT THE SILVER BULLET

Agile tailoring is crucial, because for many IS-professionals it is not easy to adapt to certain agile practices (Conboy et al., 2011) and therefore, which agile practices to choose depend on the type and size of the project and the company culture (Moe et al., 2012).

Hence, agile approaches should not been seen as a silver bullet that suits for all kinds of projects (Hohl et al., 2018). As highlighted by Andrei et al. (2019), numerous factors, such as the project size and the time to market, need to be considered when selecting the most suitable methodology for a project. A comparison between plan-driven and agile approaches is provided in Table 2.

Table 2 Comparison Plan-driven versus Agile approach (adopted from Kisielnicki and Misiak (2017))

#	**Criteria**	**Plan-driven**	**Agile**
1	Emphasis	People	Process
2	Domain	Comprehensive	Minimal-only as required
3	Quality	Process centric	Customer centric
4	Process style	Linear	Iterative
5	Organization	Managed	Self-Organized
6	Upfront planning	High	Low
7	Perspective towards change	Sustainable	Adaptable
8	Prioritization of requirements	Fixed in the project plan	Based on business value and regularly updated
9	Management style	Autocratic	Decentralized

10	Leadership	Command and control	Collaborative, servant leadership
11	Performance measurement	Plan conformity	Business value
12	Return of Investment	End of project life	Early/throughout project life

Plan-driven approaches better suit for projects where requirements are clearly specified and little change is expected (Ahimbisibwe et al., 2017, Andrei et al., 2019). On the other hand, the rationale behind the agile approach is that that quick reaction to change can deliver improved value for both stakeholders and organizations (Thorgren and Caiman, 2019). Hence, agile methodologies appear to better respond to the dynamic aspects of the environment (Ahimbisibwe et al., 2017) and therefore the preferred choice when continuous delivery and feedback is important, requirements are not well defined and time to market is more important than releasing a full feature version (Andrei et al., 2019).

2.2.4. AGILE REQUIRES PEOPLE SKILLS

The importance of people skills for agile teams to be effective has been constantly highlighted by past research and therefore it has also been repeatedly identified as critical success factor. Yet, the individual characteristics of software developers contradict with the social demands of agile practices, such as increasing collaboration and self-organization. Moreover, despite of several scholars having reported human related challenges that occur in agile teams over the last two decades, the examination of the origins of these challenges has received only few attention.

For instance, right after the Manifesto for Agile Software development was written in February 2001, scholars started to create awareness of the crucial role of the people factor. Among them, Cockburn and Highsmith (2001), who pointed out that the most important implication to managers applying agile is that it places more emphasis on people factors and the attention to human issues gives agile projects a particular feel. They argued that in contrast to traditional plan-driven managed teams, where the developers mainly focus on technical aspects, when performing a certain task that has been assigned to them by their team lead, agile teams are characterized by self-organization and intense collaboration between the team members. In the same vein, Lindvall and Williams (2002) stated that people, communication and culture are the three most important success factors when applying agile. They also pointed out that agile team members need to possess good people and communication skills for agile to be effective. Another example are Melnik and Maurer (2004), who highlighted that agile methods are human-centric bodies of software development practices and guidelines that have individuals and their interactions as crucial factor. These viewpoints have been supported by Chow and Cao (2008), who conducted a survey study of Critical Success Factors (CSF) in agile software projects among agile professionals. Based on survey data from 109 agile projects from 25 countries across the world, they concluded, that in spite of the large number of factors affecting agile projects in the literature, the actual number of CSF is quite small. The only three factors they could identify were: a correct delivery strategy, a proper practice of agile software techniques and a high-caliber team. Likewise, Misra et al. (2009) highlighted that agile practices are human-centric due to their emphasis on individuals and interaction, customer collaboration and responding to changes suggested by customers and as a result, the dependency on people and human resource factors becomes more critical. In a similar vein, Lalsing et al. (2012) investigated the underlying people skills to consider

when adopting agile to be effective, such as effective communication, social interaction or motivation. Another example is a survey study based on 200 IT-project managers conducted by Pedersen (2013). They identified three CSF directly correlated with agile project success: effective communication, user involvement and a quality plan. Likewise, Javdani Gandomani and Ziaei Nafchi (2016) pointed out that collaboration is a serious requirement of agile, yet it can be an important challenge in real environments. In a recent literature review, Kalenda et al. (2018) identified seven success factors for agile projects. Among others, they identified careful transformation and teamwork support as critical success factor. They argued that teams need time and space to adapt to agile practices and that organizations should establish a transparent environment for openness in the team without fear of discussing problems to improve teamwork.

Another people related aspect in agile teams is effective sharing of high-quality information, know-how, ideas, suggestions, skills and expertise among individuals (Ghobadi and Mathiassen, 2017). When applying agile, transparency is essential, that is information must be widely available so that team members can make informed decisions and debate about any aspect of the project (Thorgren and Caiman, 2019). Furthermore, knowledge sharing in agile teams offers opportunities to discover creative means to improve the organization's competiveness (Santos et al., 2015). Yet, as highlighted by Ghobadi and Mathiassen (2016), knowledge sharing in agile tams is challenging, i.e. to encourage and facilitate sharing tacit knowledge among team members. A related study conducted by Takpuie and Tanner (2016) found that in order to successfully transfer tacit knowledge during agile software projects, the agile team members need to possess a multitude of characteristics, such as motivation, capability, but also credibility, empathy,

articulate and the ability to communicate enough. The required people skills for agile to be successful have been summarized in Table 3.

Table 3 Agile requires people skills (author)

#	People skill	Description	References
1	Collaboration	Effective collaboration is the key factor in organizing agile teams and a lack results in difficulty in setting up a cross-functional team (Javdani Gandomani and Ziaei Nafchi, 2016).	Cockburn and Highsmith (2001); Melnik and Maurer (2004); Misra et al. (2009); Lalsing et al. (2012); Javdani Gandomani and Ziaei Nafchi (2016)
2	Self-organization	Self-organizing agile teams share activities, such as estimation, planning or requirements elicitation (Hoda and Murugesan, 2016).	Cockburn and Highsmith (2001); Moe (2013); Goh et al. (2013); Hoda and Murugesan (2016); Kakar (2017); Thorgren and Caiman (2019)
3	Knowledge-sharing	Knowledge-sharing in agile teams is the provision of task information and know-how to a person in order to accomplish a	Santos et al. (2015); Takpuie and Tanner (2016); Ghobadi and Mathiassen

		specific project task and to offer the opportunity to discover creative means (Santos et al., 2015).	(2016); Ghobadi and Mathiassen (2017); Thorgren and Caiman (2019)
4	Communication	In agile projects, close and frequent communication among team members substitutes predetermined plans (Thorgren and Caiman, 2019) and is a key factor to transfer tacit knowledge (Takpuie and Tanner, 2016).	Lindvall and Williams (2002); Lalsing et al. (2012); Pedersen (2013); Takpuie and Tanner (2016); Thorgren and Caiman (2019)
5	Motivation	Agile team members suffer from motivation issues, when they perceive their tasks as not challenging enough (Lalsing et al., 2012) or when they perceive agile practices as overly onerous, complex and time-consuming (Conboy et al., 2011).	Lalsing et al. (2012); Takpuie and Tanner (2016); Conboy and Carroll (2019)

Yet, very soon, after the first organizations started to apply agile practices, Boehm and Turner (2005) already shed light on that despite the fact that people issues are the most critical factor in successfully applying agile methodologies and at the heart of the agile movement, an increasing number of developers were getting frustrated when applying

agile methodologies in their organizations. This might be caused by the individual characteristics of IS-professionals, who have been reported to lack the appropriate interpersonal skills (Hendon et al., 2017).

IS-professionals might be accustomed to do their work in their own specific ways and it is difficult for them to adapt into a more team oriented setting (Javdani Gandomani and Ziaei Nafchi, 2016) or they dislike working in groups, because it can be cumbersome and involve conflict, might hurt feelings and therefore be is perceived to be inefficient (Gren et al., 2017). Therefore, a lack of effective collaboration between the team members is a notable challenge faced by many agile teams (Javdani Gandomani and Ziaei Nafchi, 2016), because IS-professionals are usually better trained in dealing with computers instead of human-beings (Shih et al., 2014). They also have been frequently reported to be an introverted personality type, who enjoys working alone and may get overwhelmed with too much social interactions (Beecham et al., 2008, Sharp et al., 2009, Shih et al., 2014, Hendon et al., 2017). Table 4 provides a summary of the individual characteristics of software developers reported in the scholarly literature.

Table 4 Individual characteristics of IS-professionals (author)

#	Characteristic	Description	References
1	Introvert and low need for social interaction	Some IS-professionals enjoy working alone and are getting overwhelmed with too much social interactions (Shih et al., 2014).	Beecham et al. (2008); Sharp et al. (2009); Shih et al. (2014); Hendon et al. (2017); Lee et al. (2017); Cram (2019)

2	Lack of interpersonal skills	IS-professionals need to effectively use their interpersonal skills within their roles to communicate and work well with others (Hendon et al., 2017).	Shih et al. (2014); Javdani Gandomani and Ziaei Nafchi (2016); Hendon et al. (2017);

These characteristics can be obstacles in their work, as they might want to work on their own and may lack the emotional intuitiveness to connect to other people (Lee et al., 2017). Consequently, Javdani Gandomani and Ziaei Nafchi (2016) concluded that most challenges and barriers during the agile transition are related to people-centric issues.

2.2.5. Challenges caused by Agile practices

Successfully adopting and using agile methodologies in organizations is challenging (Gregory et al., 2016). Hence, the increased recognition of the importance of the people factor for the success of agile managed projects has attracted considerable research attention to examine human-related challenges that could occur in agile teams. For example, Conboy et al. (2011) conducted case studies and uncovered many serious people challenges, including recruitment, training, motivation and performance evaluation. They also shed light on that some individuals feel uncomfortable with the increase social interaction within the team and the need for social communication and presentation skills caused by agile practices, such as stand-up meetings, retrospectives and pair programming. Another notable study has been conducted by Javdani Gandomani and Ziaei Nafchi (2016). They applied a Grounded Theory approach to identify different aspects of human-related challenges throughout the agile transition process. The results

of their study showed that the root of the emerged issues is the people's perception about the agile transition, such as the resistance to change, a lack of effective collaboration and being worried about the change process from traditional methods to agile.

Furthermore, in contrast to plan-driven approaches, where team members execute only their assigned tasks within their specified roles, such as business analyst or programmers, agile teams organize themselves (Kakar, 2017, Thorgren and Caiman, 2019). However, self-organizing teams might struggle when they are meant to take over and share project management tasks that fall outside of their traditional skill areas, such as estimation, planning and requirement elicitation (Moe et al., 2012, Hoda and Murugesan, 2016). Furthermore, the nature of some agile practices can also result in resistance, i.e. pair programming, when two individuals work on a single coding exercise collaboratively, but are accustomed to working alone on such tasks or some developers might feel uncomfortable with open-plan workspaces and prefer a more private working environment (Cram, 2019).

Hence, one often underestimated aspect is that agile teams require very senior professionals that are able to work in a self-managed way and possess the required mix of technical, behavioral and business knowledge (Goh et al., 2013) and are willing to take risks and experiment through trial-and-error iterations (Lee and Xia, 2010). Therefore, the impact of using unexperienced professionals as well as having key-players leaving an agile managed project can be much more significant than for plan-driven managed projects (Canty, 2016). The people factor has even been accentuated to the point that Radujković et al. (2014) recommended that project team members should be very good, if not the best available.

A decade ago, Conboy et al. (2011) already highlighted the importance to identify the problems that the transition to agile methods can cause. Yet, although agile practices place new demands on developers, research on the consequences for the individual developer is scarce (Fortmann, 2018) and only scant attentions has been paid to the required personal skills and competency in overcoming these issues (Rezvani and Khosravi, 2019). Yet, a construct that has so far only received little attention is Emotional Intelligence. As illustrated by Mayer et al. (2001), emotions typically occur in the context of relationships and in this context emotional information is information about forms of these relationships. Emotional Intelligence in turn, refers to an ability to recognize the meanings of emotions and their relationships and to use them as a basis in reasoning and problem solving.

2.3. Emotional Intelligence

The concept of EI was established around 25 years ago and since then it has gained increasing popularity among researchers and professionals (Sanchez-Gomez and Breso, 2019).

According to Ashkanasy and Daus (2005) and Mayer et al. (2008a), the first scientific references of Emotional Intelligence can be traced back to the 1960s, when EI has been associated with psychotherapy (Leuner, 1966) or to promote personal and social improvement (Beasley, 1987, Payne, 1986). Though, the first notable scientific article about EI has been published by Mayer et al. (1990) in that they introduced Emotional Intelligence as “an ability to accurate appraise and express emotions and to regulate them in a way to enhance living”. Then, there was little interest from either academics or the general public for the next five years (Bucich and MacCann, 2019). However, with his

book that appeared in The New York Times best-seller list, Goleman (1996) then boosted the diffusion of EI not only in academia, but also to the general public and since then, EI has been becoming increasingly popular and discussed in printed media and even talk shows (Ciarrochi et al., 2000). The diffusion has also been accelerated by the increasing personal importance of emotion management for individuals in modern society (Roberts et al., 2001). Since then, a large volume of evidence has been established that indicate EI to predict outcomes such as academic performance, emotional labor, life satisfaction, trust or team process effectiveness (Miao et al., 2017). Yet, the rapid rise of EI from obscurity to massive popularity meant that different scholars worked largely in parallel, each proposing different concepts of EI, which consequently lead to confusion of contradictory results and findings (Bucich and MacCann, 2019).

2.3.1. EMOTIONS

Emotions are subjective experiences permeating every area of people's lives (Petrides et al., 2016). Yet, despite of the central role of emotions in human experience, there still is a remarkable vigorous debate about the nature and origins of emotions (Shackman and Wager, 2018).

The debate starts with the fundamental question about the structure of emotions and scientists debate whether emotions are best described along dimensions of valence and arousal or as discrete events (Harmon-Jones et al., 2017). As a consequence, various definitions of emotions exists. For example, Fredrickson (2001) describes an emotion to typically begin by an individual assessment of some related event. The following appraisal process, which can happen conscious or unconscious, when triggers a cascade of response tendencies, such as subjective experience, facial expression, cognitive

processing and psychological changes. Another notable working definition has been introduced by Mayer et al. (1999), who view emotions as internal events that coordinate many psychological subsystems including physiological responses, cognitions, and conscious awareness. When emotions emerge, they will entail coordinated changes in physiology, motor readiness, behavior, cognition, and subjective experience. For example, when an individual experiences happiness, he might have lower blood pressure, may also smile and feel good inside (Mayer et al., 2008a).

Dating back to the ancient Greeks, emotions have been negatively assumed to wreak havoc on human rationality and thus the emphasis for years in psychology research has been on ways of diminishing the influence of emotions in decision making and behavior (Cacioppo and Gardner, 1999). Similarly, emotions at the workplace is traditionally discourage by social and occupational expectations (Jia et al., 2017). Yet, emotions are ubiquitous and powerful experiences that are central to how we relate to our environment and each other (Ford et al., 2018). Hence, as individuals cope with a range of positive and negative events and interactions at work, the importance of the experience and role of emotions becomes clear (Speights et al., 2019) and scholars increasingly recognize the significance of exploring emotions at work (Jia et al., 2017). Furthermore, as emotions play a key role in a range of cognitive, perceptive and bodily processes, they form a crucial part of intelligence (Picard et al., 2001, Schuller and Schuller, 2018).

2.3.2. INTELLIGENCE

Individuals differ from each other in their abilities, e.g. to comprehend complex ideas, to effectively adapt to various circumstances, to learn from experience, to engage in different kinds or reasoning or to overcome obstacles (Neisser et al., 1996). For these tasks, they

need abilities as seeing the similarities and differences among object, being able to analyze their relationship to each other and as a whole and generally being able to reason validity within and across content domains (Mayer et al., 2001). In order to grasp this complex set of abilities, neuroscientists have introduced various concept of intelligence.

Among scientists, one predominant view on intelligence is that there is either one general intelligence *g* or two types of intelligence: fluid and crystalized (Shearer and Karanian, 2017). When intelligence is viewed as one general it refers to the Theory of Unitary Intelligence. This theory conceptualizes intelligence as one general mental ability factor, which Spearman (1927) termed "*g*" for general ability. *g* can broadly be defined as a mental ability to adapt through effective cognition and information processing, i.e. by understanding, reasoning, problem solving and learning (Roberts et al., 2001). Yet, the concept of general intelligence lacks to answer which specific abilities actually comprises it. Thus, from the beginning of intelligence theorizing there has also been a debate not only about the nature of intelligence, but also if different types of intelligences might exists? Unitary intelligence theory has hence been challenged, regarding potential sub-divisions of intelligence and their relationship to *g* (Shearer and Karanian, 2017). Although, the discovery of *g* was a milestone in the history of intelligence theory, it's eventual concession that there were important group factors that were neither general nor specific was also extremely important (Schneider and Newman, 2015) and as stated by Mayer et al. (2008b), even the fiercest of *g* theorists allow for the existence of more specific ability factors. From their stance, *g* is basically understood as the variance that all the different specific abilities have in common. When intelligence is conceptualized as two types of intelligence, it refers to the Theory of fluid and crystallized intelligence proposed

by Horn and Cattell (1966). Whereas fluid intelligence addresses process-dependent abilities, crystallized intelligence addresses memory-dependent abilities.

Although, the predominant view of human resource management scholars is that intelligence is unidimensional (Schneider and Newman, 2015), researchers have also put considerable effort in proposing conceptualizations of intelligence as multidimensional. For example, the Theory of Multiple Intelligence proposed by Gardner (1983), which includes the eight intelligences: linguistic, logical-mathematical, visual-spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal and naturalist. Gardner (1983) described intelligence as the ability to solve problems or to create valuable products in a culture or community. Based on this definition Petrides and Furnham (2001) have thus spotted this theory as “embryonic” form of EI. An alternative way to divide intelligence can be based on the type of information that is their focus (Mayer et al., 2008b), such as Sternberg’s Triarchic Theory of Intelligence (Sternberg, 1985). It consists of three different types of intelligence: analytic, creative and practical. This conceptualization emphasizes the need to balance between analytic intelligence, on the one hand and creative and particular practical intelligence on the other (Neisser et al., 1996).

Yet, the current most widely accepted and empirically validated psychometric theory of intelligence is the Cattel-Horn-Carroll (CHC) Theory of cognitive abilities (MacCann et al., 2014, Schneider and Newman, 2015). CHC Theory has been proposed by McGrew (2005) with the consent of Horn and Carroll. This theory describes intelligence as consisting of ten or more broad abilities, which themselves are composed of several narrow abilities (Elfenbein and MacCann, 2017). Broad intelligence include intelligences such as fluid intelligence (Gf), crystallized intelligence (GC), quantitative reasoning (Gq), auditory

processing (Ga), olfactory processing (Go) or visual processing (Gv) (MacCann et al., 2014, Schneider and Newman, 2015, Evans et al., 2019). However, as it aims to be a complete taxonomy of cognitive abilities it can therefore be overwhelming at first glance (Schneider and Newman, 2015). An overview of notable concepts and models of intelligence is provided in Table 5.

Table 5 Concepts and models of intelligence (author)

Concept	**Author**	**Number and type of intelligences**
Theory of Unitary Intelligence	*Spearman (1927)*	One: general intelligence *g*
Theory of fluid and crystallized intelligence	Horn and Cattell (1966)	Two: fluid and crystalized intelligence
Theory of Multiple Intelligence	Gardner (1983)	Eight: e.g. linguistic, musical or interpersonal
Triarchic Theory of Intelligence	Sternberg (1985)	Three: analytic, creative and practical
Theory of cognitive abilities	McGrew (2005)	Ten: e.g. quantitative, auditory or visual

Despite its name, it is still controversial if Emotional Intelligence can be viewed as a new type of intelligence (MacCann et al., 2014, Olderbak et al., 2019). This heated debate is also due to scholars not being aligned in regard to how the psychological concept EI should be defined and measured, with different competing approaches to theory and measurement (Herpertz et al., 2016, Elfenbein and MacCann, 2017).

2.3.3. THE SCHISM OF EMOTIONAL INTELLIGENCE

Since the introduction of EI, scholars have proposed to distinguish between different conceptualizations of EI: ability, trait and mixed EI. As a result, a schism about the definition and scope and how EI should be assessed has developed within the research community (Petrides and Furnham, 2000, Christie et al., 2007, Mayer et al., 2008b, Bucich and MacCann, 2019). However, in order to make sense of any EI research, it is critical to acknowledge that the label Emotional Intelligence actually refers to three different concepts, which are both theoretically and empirically distinct (Bucich and MacCann, 2019).

One current view is that two theoretical conceptualizations of EI exist that dominate the field: ability and trait EI (Elfenbein and MacCann, 2017, Thomas et al., 2017, Olderbak et al., 2019, Macht et al., 2019). Here, ability and trait EI are distinguished based on how they are assessed. If EI is assed as typical behavior via self-report, then it is referred to as trait EI and otherwise, if assessed based on maximal effort, it is referred to as ability EI (Olderbak et al., 2019). Furthermore, as scholars are also not aligned whether non-cognitive competencies, such as motivation, personality or temper should be part of EI or not (Cho et al., 2015), EI can also be distinguished based on its scope into ability EI and mixed EI (Mayer et al., 2001, MacCann et al., 2014, Mattingly and Kraiger, 2019). Here, ability EI is understood as a distinct group of mental abilities and mixed EI, as a mix of positive traits, such as happiness, self-esteem and optimism (Mayer et al., 2008b).

While there is a generally-agreed-upon definition of ability EI, there are many different views in regard to trait EI and mixed EI (Bucich and MacCann, 2019). Mixed EI if often described as a synonym of trait EI (Joseph et al., 2015, Costa and Faria, 2016, Carvalho et al., 2016, Schlegel and Mortillaro, 2019) or as a version of trait EI (Macht et al., 2019).

In contrast, trait and mixed EI are also described as being two distinct constructs (Frederickson et al., 2012). In fact, they belong to two different taxonomies of EI, either the distinction is based on the measurement approach or based on the scope of EI.

2.3.4. Distinction between Trait EI and Ability EI is vague

Trait EI essentially concerns people's perception of their emotional world and has his roots in the longstanding study of emotions from a personality perspective (Petrides et al., 2016). Petrides and Furnham (2001) emphasized that trait and ability EI are two distinct labels for two fundamentally different constructs. One construct is measuring 'emotional self-efficiency' and the other one 'cognitive-emotional ability'. In their view, a trait as a disposition, with a strong relationship to the basic dimensions of personality and clearly stated that it is not a cognitive ability. Hence, trait EI refers to a constellation of emotional self-perceptions located at the lower levels of personality hierarchies (Frederickson et al., 2012). In fact, scores on ability EI tests have been found to have a low correlation with scores on traits EI tests and consequently Lee and Kwak (2012) also recommended that the two types of EI should be treated as distinct constructs.

Petrides and Furnham (2001) emphasize the importance of measurement in the conceptualization of EI. Trait EI is commonly assessed within empirical investigation via self-report measures and ability EI commonly assessed via performance-based assessments (Thomas et al., 2017). Petrides et al. (2016) argued that every research in the field of EI that is based on self-reports, de facto is conducted within the broader domain of trait EI. Scholars applying self-report EI measures have reported that trait EI is a predictor of job performance (Joseph et al., 2015) and socioemotional outcomes

(Frederickson et al., 2012) and also that trait EI is the predominant concept of EI in sports research (Sukys et al., 2019).

However, his taxonomy ignores that it is critical to distinguish between the underlying construct and method as highlighted by Arthur and Villado (2008). As a result, this taxonomy created confusion when rating scales as well as ability tasks were used to measure ability EI (Bucich and MacCann, 2019), that is ability EI can be measured both, via self-report or via performance-based tests (Joseph and Newman, 2010b). Consequently the distinction between trait and ability EI became vague and hence, this study does not distinguish between ability and trait EI, but between ability and mixed EI.

2.3.5. MIXED EI AS AN UMBRELLA TERM

In contrast to ability EI, mixed EI is used as an umbrella term that encompasses a constellation of personality traits, affect and self-perceived emotional abilities (Joseph et al., 2015). Although, it includes emotion-related qualities it is mixing in related and unrelated attributes (Mayer et al., 2008b), such as motivational factors and affective dispositions (Roberts et al., 2001). As it therefore includes attributes that are not abilities, mixed EI is per definition outside the realm of intelligence, in contrast to ability EI models that conceptualizes EI as a form of intelligence that links emotions and cognition (Herpertz et al., 2016, Olderbak et al., 2019). One notable model of mixed EI is Bar-On's Model of Emotional-Social Intelligence (Bar-On, 1997).

2.3.5.1. BAR-ON'S MODEL OF EMOTIONAL-SOCIAL INTELLIGENCE

The model of Emotional-Social Intelligence (ESI) introduced by Bar-On (1997) is similar to the initial version of EI introduced by Salovey and Mayer (1990), which viewed emotions

as part of social intelligence. As outlined by Bar-On (2006), there are various roots that have set the theoretical foundation for this model. For example, Darwin's theory of effective adaption, which shed light on the importance of emotional expression for survival and adaption or Thorndike's notion of social intelligence and its importance for human behavior, as well as Wechsler's notion of intelligent behavior, which describes the impact of non-cognitive and cognitive factors. At the core of Bar-On's model is the construct of emotional-social intelligence, which Bar-On (2006) defined as "a cross section of interrelated emotional and social competencies, skills and facilitators that determine how effectively we understand and express ourselves, understand others and relate with them, and cope with daily demands." This model includes five broad domains underlying EI: intrapersonal, interpersonal, stress management, adaptability and general mood (Bucich and MacCann, 2019). According to Bar-On (2006) validation studies indicated that ESI is neither related to cognitive intelligence nor to personality and thus should be viewed as distinct and separate construct.

The Bar-On model conceptualizes EI more broadly, that is it combines mental abilities, traditional personality traits and dispositions, such as motivation and optimism (Herpertz et al., 2016). It has therefore been criticized to include sub facets of self-actualization and impulse control, which are similar to the industriousness and self-control facets of conscientiousness (Joseph et al., 2015). In a similar vein, Mayer et al. (2008a), stated that this model has a lack of EI as primary focus. They argued that qualities such as problem solving and reality testing are more associated to ego strength or social competence rather than EI (Mayer et al., 1999).

2.3.6. Ability EI

Salovey and Mayer (1990) were the first scholars to claim that people differ in their intelligence about emotions and then suggested the existence of a new form of intelligence, which they labeled Emotional Intelligence. Their concept of Ability EI began with the idea that emotions contain information about relationships (Mayer et al., 2001) and that EI comprises specific mental abilities in processing emotional information (Herpertz et al., 2016). Ability EI can hence be understood as the accumulation of behaviors and abilities that contribute to an individual's success at recognizing and managing emotions (Mattingly and Kraiger, 2019). Yet, although associated to both emotions and (general) intelligence, Mayer et al. (2008a) emphasized that it is a distinct construct itself (Mayer et al., 2008a) and in particular distinct from both competency and personality (Kim and Kim, 2017). Hence, by distinguishing it from personality and other domains of intelligence, EI focuses on the unique contribution of emotional skills (Lopes, 2016).

2.3.6.1. Salovey and Mayer's Four-Branch Ability Model of Emotional Intelligence

In 1997, Mayer and Salovey (1997) introduced the initial version of their Four-Branch Model of Emotional Intelligence, which included perceiving emotions, understanding emotions, managing emotions and facilitating thought with emotions, which are presented in Table 6.

Table 6 Four-Branch Model of Emotional Intelligence (adopted from Mayer et al. (2001) and Mayer et al. (2016))

Branch	Description	Types of Reasoning
4: Managing emotion	Ability to manage emotions and emotional relationships for personal and interpersonal growth	• Effectively manage one's own and others' emotions to achieve a desired outcome • Engage with emotions if they are helpful; disengage if they are not
3: Understanding emotion	Ability to comprehend emotional information about relationships, transitions from one emotion to another, linguistic information about emotions	• Recognize cultural differences in the evaluation of emotions • Determine the antecedents, meanings and consequences of emotions
2: Facilitating thought with emotion	Ability to harness emotional information and directionality to enhance thinking	• Prioritize thinking by directing attention according to present feelings • Generate emotions as a means to related to experiences of another person
1: Perceiving emotion	Ability to identify emotions, e.g. faces and pictures	• Identify emotions in one-w own physical states, feelings and thoughts • Perceive emotions in others through their vocal cues, facial expressions, language and behavior

Their model is hierarchical in the context of an individual's personality. That is emotional understanding is related to cognitive processing and abstract reasoning, emotion management created an interface between the cognitive system and the general personal system and emotional understanding is less cognitive, because it must balance many factors, such as motivational, emotional and cognitive (Mayer et al., 2001).

Mayer et al. (2016) recently reformulated their ability model of emotional intelligence to reflect proceedings of current research and presented seven principles that guided their current thinking about EI, which are presented in Table 7.

Table 7 Seven principles of the Four-Branch Model of Emotional Intelligence

Principle	**Description**
Principle 1	EI is a mental ability
Principle 2	EI is best measured as an ability
Principle 3	Intelligent problem solving does not correspond neatly to intelligent behavior
Principle 4	A test's content - the problem solving area involved – must be clearly specified as a precondition for the measurement of human mental abilities
Principle 5	Valid tests have well well-defined subject matter that draws out relevant human mental abilities
Principle 6	EI is a broad intelligence
Principle 7	EI is a member of the class of broad intelligences focused on hot information processing.

With these seven principles, Mayer et al. (2016) attempted to clarify earlier statements that were unclear in regard to their ability model of EI and positioned EI amidst other hot, broad intelligences, such as personal and social intelligence. With this update their model provides a relatively focused definition of EI, which is aligned with prevailing notions of intelligence (Lopes, 2016).

2.3.6.2. THREE AND SIX-BRANCH MODELS OF ABILITY EI

Joseph and Newman (2010b) proposed a cascading model of EI. It is based on Mayer and Salovey (1997) ability model and includes three of the four EI branches, which are emotion perception, emotion understanding and emotion regulation. The branch emotion facilitation is not included doe to the conceptual overlap with other EI branches and its lack of empirical distinctiveness (Herpertz et al., 2016). This branch is in particular not conceptually distinct from emotion regulation, because using emotions to help task performance involves intentionally inducing the desired emotion for the task, whereas induction of emotions is the key essence of emotion regulation (MacCann et al., 2014).

The cascading model of EI also highlights the extent in which the three remaining EI branches fit a progressive structure, in which emotion perception causally precedes emotion understanding and which in turn gives rise to conscious emotion regulation and job performance (Joseph and Newman, 2010b). This is important, because reasoning about emotions is not necessarily discrete, but problem-solving can spill or cascade into one another (Mayer et al., 2016). For example, emotion perception is often helpful to accurate emotion understanding (Mayer et al., 2016), because the awareness of emotions enables individuals to learn how emotions function by accumulating knowledge regarding

the causes and consequences of emotions and how they evolve over time (Shao et al., 2015).

Another model of ability EI has been recently proposed by Elfenbein and MacCann (2017). This model is also based on the four-branch ability EI model of Mayer and Salovey (1997) but includes six branches, which are perceive emotions, express emotions, understand emotions, regulate own emotions, regulate others' emotions and emotion attention regulation. Elfenbein and MacCann (2017) argued that expression of emotions constitutes a key skill within EI and thus should be considered as distinct narrow ability. Furthermore, the ability to selectively engage or disengage from emotion-laden stimuli was missing in the four-branch model and hence they introduced the new branch of emotion attention regulation.

Although, Joseph and Newman (2010b) and Shao et al. (2015) have reported good model fit for the cascading model of EI, to the author's knowledge, research applying the cascading model or the six-branch model of EI is sparse. Hence, the four-branch ability EI model of Mayer and Salovey (1997) is considered as the predominant theoretical ability EI model (MacCann et al., 2014) and has generated the most research (Fernández-Berrocal and Extremera, 2016).

2.3.7. Ability EI as a Form of Intelligence

The ability conceptualization of EI considers EI as a new type of intelligence rather than a trait or competency (Kim and Kim, 2017). To the extent that EI may truly been considered as a valid type of intelligence, this would have broad implications for the areas of work life, social life and educational life that the concept touches (Elfenbein and MacCann, 2017).

The initial work of Salovey and Mayer (1990) started with a working description of EI as:

"*Emotional intelligence is a type of social intelligence that involves the ability to monitor one's own and others' emotions, to discriminate among them, and to use the information to guide one's thinking and action.* " *(Salovey and Mayer, 1990).*

This definition has viewed EI as part of social intelligence and suggested that both, EI and social intelligence are related and represent intercorrelated components of the same construct (Bar-On, 2006). Salovey and Mayer (1990) have thus been criticized for connecting emotions and intelligence, i.e. that they are redescribing social intelligence in a way that there are no important unique abilities connected to emotions and that thus intelligence is an inappropriate and misleading metaphor for their proposed construct (Mayer and Salovey, 1993). Similarly, Locke (2005) stated that the concept of EI is invalid, because it is not a form of intelligence. For example, he argued that, the ability to monitor one's emotions does not require any special type of intelligence, but is basically a matter of where one chooses to focus one's attention. Furthermore, they illustrated that discriminating between emotions is a learned skill and just a matter of focusing inwards so as to develop one's intrapersonal skill and whether one uses one's knowledge in everyday action is not an issue of intelligence per se, but many other factors, such as rationality, focus, integrity and the nature of one's purpose. On contrary, Mayer et al. (1999) argued that EI can be scientifically legitimated as a kind of intelligence, because it meets the three stringent criteria of true intelligence: conceptual, correlational and developmental.

The conceptual criteria requires that the proposed primary mental abilities underlying EI must relate empirically and form a single coherent factor (MacCann et al., 2014). Mayer et al. (2008b) argued that EI is a set of related mental abilities and consequently indeed an instance of a general intelligence. In their view intelligence has to be distinguished from personality, because intelligence involves organismic abilities to behave, whereas personality traits involve dispositions toward behavior (Mayer and Salovey, 1993). As illustrated by Mayer et al. (2008a), their ability model of EI distinguishes between four branches of problem-solving abilities required for emotional reasoning: accurate perceiving of emotions, using emotions to facilitate thought, understanding emotions and managing emotions in oneself and others. Each of these branches represents a set of skills that developmentally proceed from basic to more advanced tasks. For example, perceiving emotions starts with basic tasks, such as identifying emotions, felling and thoughts and then proceeds with more advanced tasks, such as discriminating between truthful and dishonest expressions of feelings (Mayer et al., 2016).

The correlational criteria requires these abilities to be intercorrelated among themselves, i.e. they have to form a set of closely related abilities, but also to be correlate to already-established classes of intelligence, such as verbal or performance intelligence (Mayer et al., 1999). Yet, EI should not merely be a replication of an existing construct (MacCann et al., 2014). This has been supported, e.g. by Joseph and Newman (2010b), who reported evidence that general intelligence *g* is positively correlated with all four branches of ability EI. They argued that the ability model of EI is theoretically based in emotion and emotion regulation and hence have a relationship with general cognitive ability. Other related studies conducted by MacCann et al. (2014) and Evans et al. (2019) explored various unidimensional, oblique, hierarchical and bi-factor models and reported that that ability EI

can be best understood as a distinctive second-stratum ability within factor models of broad cognitive ability. Furthermore, EI can predict important tendencies and outcomes, which exceed what can be predicted by general intellectual ability (Roberts et al., 2001), such as motivation to participate in sports (Sukys et al., 2019), team performance (Macht et al., 2019), higher job satisfaction and organizational commitment (Miao et al., 2017) or psychological and physical well-being (Nelis et al., 2011).

The development criteria requires EI abilities also to develop with age and accumulation of life experience from childhood to adulthood (Mayer et al., 1999, Mayer et al., 2008a). As illustrated by Costa and Faria (2016), emotion perception is within the first days of life and evolves rapidly to recognizing different emotions and utilizing them. Emotional understanding further develops with newly acquired language skills, which enables children to label their emotional states. This view, was supported by development psychologists, who were able to trace how EI emerges over time from infancy to adolescence as a person develops in a social context (Cabello et al., 2016). Yet, studies whether EI varies for adolescents are scant (Yuan et al., 2012) or have given inconsistent findings (Cabello et al., 2016). For example, Iliceto and Fino (2017) investigated Italians between the age of 18 to 58 and did not find any differences in regard to age. On the other hand, a longitudinal study conducted by Keefer et al. (2013) found that individual differences in EI became increasingly more stable with age followed by a complex nonlinear pattern over time. Similar results have been reported by Cabello et al. (2016), who found that EI develops as an inverted U-curve. They reported that middle-age adults score higher in EI than other adults and argued that age-related decline in cognitive functions lead to lower ability EI in older adults. However, to the authors' knowledge and as highlighted by other scholars before, empirical evidence on whether EI changes for

adolescents over time is scant and thus, EI has been primarily treated as a static variable, even in carefully conducted longitudinal studies (Zeidner et al., 2009, Yuan et al., 2012).

Emotional Intelligence, despite its name, was and still is controversial as a new type of intelligence (Olderbak et al., 2019). Yet, as illustrated above, there is growing evidence to suggest that ability EI can represent a distinct set of cognitive abilities, that can be placed within existing intelligence frameworks (Evans et al., 2019). MacCann et al. (2014) and Evans et al. (2019) used hierarchical and bi-factor models to evaluate whether EI fits into the CHC three-stratum model of intelligence. Both reported acceptable relative fit and therefore proposed to include EI as a new 2nd-stratum factor of similar standing to factors, such as fluid intelligence and visual processing. Mayer et al. (2016) thus concluded that Emotional intelligence fits the description of a new broad intelligence within the CHC three-stratum model of intelligence.

2.3.8. Emotional Intelligence as neglected component of Artificial Intelligence

The promise of Artificial Intelligence (AI) is undeniable and the hype and fear surrounding it are greater than that which accompanied the discovery of the structure of the DNA or the whole genome (Israni and Verghese, 2019). Artificial Intelligence can be understood as a scientific discipline aimed at creating machines that can perform tasks that require human intelligence (Rossi, 2018). Although, AI technologies have evidently demonstrate how they enhance our lives, e.g. our smartphones, online shopping services, ability to search and find what we like, our smartwatches and how business connect with and understand customers, many challenges remain to be met, for AI to take off with all on board (Helal, 2018). According to Rossi (2018), the current research in AI focus on two

main areas. One is based on rules, logic and symbols. It is explainable and will always find the correct solution for a given problem, if that problem, has been correctly specified. The other area of research is based on examples, data analysis and correlation and can be applied in cases where there is an incomplete definition of the problem to be solved. However, when it comes to AI, emotions are not usually the first thing that comes to mind (Schuller and Schuller, 2018).

Yet, developing Artificial Emotional Intelligence (AEI), in particular the ability to recognize emotions and then respond appropriately, is essential to the true success of digital assistants we interact with every day, such as Apple's Siri or Google's Alexa (Krakovsky, 2018). As stated by Schuller and Schuller (2018), the major components of AEI are emotion recognition, emotion generation, and emotion augmentation. The research on emotion recognition has focused on analyzing acoustic speech, spoken and written linguistic content, facial expressions, body posture and physiological measurements, such as hear rate or even brain activities. Examples of emotion-dependent generation include text and haptic feedback, emotion-driven facial expressions, body posture and movements. Emotion augmentation focus on applying emotion in planning, reasoning or more general goal achievement. As a result, the fascination with AEI has led to the emerge of fields such as affective computing, social and behavioral computing, and emotion-augmented machine learning (Schuller and Schuller, 2018). Yet, research about AEI can only advance, if research about its core component EI also continues to advance. Only such understanding will enable computer scientists to create computers or robots that emulate human reasoning (Mayer et al., 2016).

2.3.9. NEGATIVE EFFECTS OF EMOTIONAL INTELLIGENCE

Scholars have emphasized on the positive relation between EI and leadership (Rosete and Ciarrochi, 2005), health and well-being (Zeidner et al., 2012) or job satisfaction (Trivellas et al., 2013). Yet, there is also emerging evidence that in a particular context, EI does not appear helpful or may even be deleterious to a person, or those they have contact with (Davis and Nichols, 2016). High levels of specific abilities of EI may backfire and heighten individual's risk for negative outcomes (Thomas et al., 2017). For example, Ciarrochi et al. (2002) reported that individuals high in emotional perception appear to be more strongly impacted by stress and therefore expressing higher levels of depression, hopelessness, and suicidal ideation. Davis and Nichols (2016) conducted a literature review to examine when, why and how EI may contribute to negative intrapersonal, e.g. psychological ill-health and stress and interpersonal outcomes, e.g. emotional manipulation or antisocial behavior. They concluded that although negative effects were found, these were often indirect, suggesting that outcomes depend on pre-existing qualities of the individual. They also shed light on the possibility of optimal levels of EI and that uneven profiles of EI might contribute to poorer outcomes, particularly emotional awareness and management. In the same vein, Martínez-Monteagudo et al. (2019) argued that high levels of attention to emotions unaccompanied by the ability to understand and regulate them report a greater number of physical and depressive symptoms, more anxiety, and a greater tendency to supress their negative thoughts or decrease their physical and social function.

2.4. How should EI be assessed?

Although, emotions have become a central topic of research in the past 30 years in several domains of psychological science, disparate approaches to define and measure EI have still produced rather inconsistent findings (Schlegel and Mortillaro, 2019) and hence there is an ongoing philosophical debates about EI's theoretical premise, development and measurements (Macht et al., 2019).

Different EI measurement tools are available. The first tools were introduced around 20 years ago and include the Bar-On Emotional Quotient Inventory (Bar-On, 1997) or the Mayer-Salovey-Caruso Emotional Intelligence Test (Mayer, 2000). With the increasing popularity of EI scholars got also interested in developing EI measures that are designed to be applied for working professionals, such as the Wong and Law Emotional Intelligence Scale (Wong and Law, 2002) or recently the Geneva Emotional Competence Test (GECo) (Schlegel and Mortillaro, 2019). Yet, with so many existing measurements, which are also based on different conceptualizations of EI, it was important to distinguish them into different streams. A taxonomy of assessment tools of EI that is now widely acknowledged (Herpertz et al., 2016, Lopes, 2016, Fernández-Berrocal and Extremera, 2016, Schlegel and Mortillaro, 2019, Bucich and MacCann, 2019) has been created by Ashkanasy and Daus (2005) and consists of three assessment streams: Ability EI-performance, Ability EI-self-report and Mixed EI-self-report as shown in Figure 3.

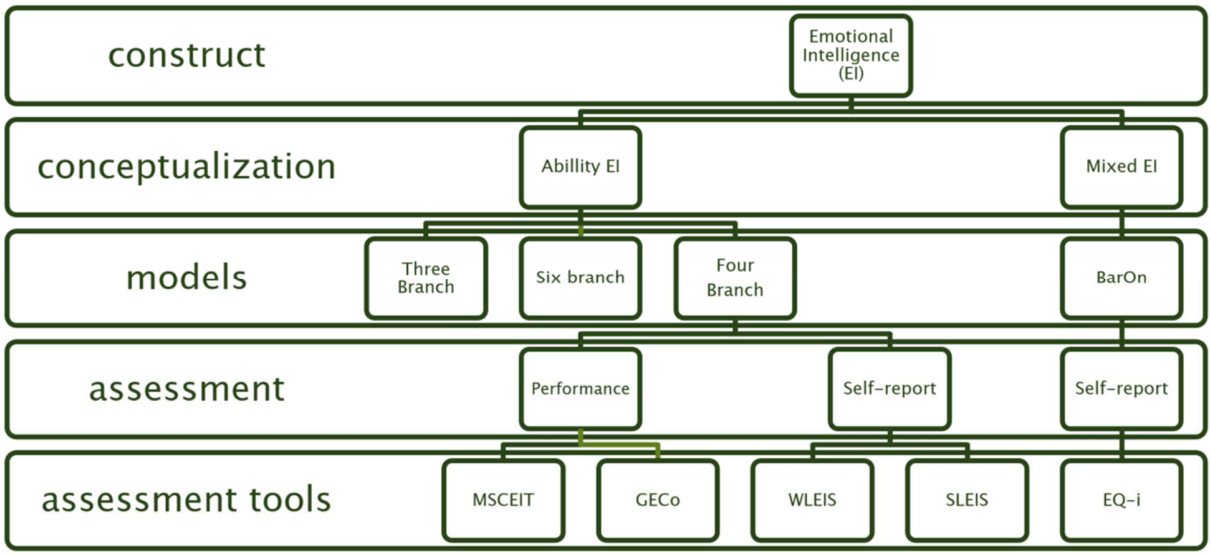

Figure 3 Models of EI and their assessment tools (author)

As illustrated by Lopes (2016), the first stream is based on Salovey and Mayer's ability model and is measured via performance-based tests. The second stream is inspired by the ability model and utilizes subjective assessments of emotional abilities and the third stream is based on so-called mixed models of EI and also relies on subjective assessments. The most notable assessment tool are now discussed in more detail.

2.4.1. Mayer-Salovey-Caruso Emotional Intelligence Test to assess performance-based ability EI

The Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) is known for being one of the first established and remains the only performance-based ability EI assessment tool (Macht et al., 2019). The MSCEIT is based on Salovey and Mayer (1990) Four-Branch model. The MSCEIT is composed of eight individual tasks, whereas two tasks are used to measure each of the four branches of the model (Mayer et al., 2008a). The respondents are presented with problems, such as identifying the emotions shown in a photograph,

understanding blends of emotions and judging what response would lead to an appropriate regulation of emotions (Schutte and Malouff, 2012). Responses are then scored with respect to their degree of correctness, with a pool of responses provided by 21 emotions experts or a normative sample of the general population (Mayer et al., 2008b).

Though, one inherent difficulty relates to the score criteria (Sanchez-Gomez and Breso, 2019). When using consensus scoring method it is unclear whether a more popular answer is really the “better” one and because it awards the highest scores to individuals that agree with the majority of the population (Schlegel and Mortillaro, 2019). Moreover, as highlighted by Carvalho et al. (2016), there is no consensus among experts in regard to the evaluation of the responses. In a similar vein, Conte (2005) expressed concerns about the absence of scientific standards for determining the accuracy of the applied consensus and expert scores. For example, it is unclear how experts are selected. Furthermore, Lee and Kwak (2012) shed light on that the cultural context might affect people’s emotions and it is thus not certain if a measurement developed within a specific cultural setting can also be applied in another cultural setting. As outlined by Law et al. (2008), a non-reactive quiet response to an unreasonable demand, e.g. of an individual’s manager, may been seen as “smart” according to the Chinese culture but probably not in the American culture. Or when respondents are asked to assess emotions expressed in pictures of several American faces, Asian respondents might not be able to read these expressions, as they are not familiar with the American culture. Law et al. (2008) thus argued that norm-referenced criteria are unreliable and invalid across cultures.

Another concern has been raised by Brannick et al. (2009), who reported problems with reliability, when using the MSCEIT on medical students and thus stated that the interpretation of the unreliable branch scores for individuals appears to be questionable and thus feedback to individuals appear to be of limited value. Furthermore, Carvalho et al. (2016) also highlighted that it takes considerable time to complete the 141 items of the MSCEIT and the high costs of its application. Kosti et al. (2014) even suggested to avoid commercial EI measures, since they make replication studies hard or even impossible. Macht et al. (2019) also raised concerns that ability tests presume that there is nothing an individual can do to alter their measures of EI.

Lopes (2016) thus concluded that measuring EI as an ability remains a big challenge. They argued that the most well-known ability EI tests are situational judgment tests. Test-takers provide responses to hypothetical situation about which they are only provided with limited information. In addition, situational tests only evaluate general knowledge about the effectiveness of various strategies rather than the ability to apply them in real circumstances, e.g. under stress. Furthermore, they do not evaluate the ability to express emotions effectively, as well as the complexity of managing emotions in social context. Furthermore, although measuring EI as an ability with performance-based test is by many to be the most appropriate approach, none of them is designed to specifically asses EI in the workplace (Schlegel and Mortillaro, 2019).

2.4.2. Self-Report Assessment of EI

Self-report measures of EI have the advantage that they are somewhat easier to construct, administer and score (Shi and Wang, 2007) and another important advantage

of them to organizational researchers is that they are also more practical in terms of the costs of money and time (Law et al., 2008).

However, self-report measures have been criticized, because individuals might be influenced by their self-esteem and mood when estimating their EI (Sanchez-Gomez and Breso, 2019). Moreover, individuals have limited self-knowledge concerning their emotional abilities (Herpertz et al., 2016) and test-takers might be prone to self-enhancement and socially desirable responses (Lopes, 2016). Yet, Tett et al. (2012) argued that not everyone fakes on the same degree, owing to differences in cognitive ability and also dependent on job-relevant traits. Comparing applicants for three different jobs, they reported that faking on self-report EI measures was greatest when applying for positions as nurse, moderate for managers and weakest for programmers. Besides, as stated by Li et al. (2012), self-report EI measures are more efficient and a common approach to assess EI in cross-cultural settings, because they tap into typical attributes of the individual's thoughts, feelings, and behaviors in certain situations. Subjective assessments may even provide a more comprehensive view of (perceived) emotional abilities than performance-ability tests, because test-takers are more likely to draw upon their full range of emotional experience across different context in life (Lopes, 2016).

2.4.3. Emotional Quotient Inventory to assess Self-Report Mixed EI

The Bar-On model of emotional-social intelligence is operationalized by the Emotional Quotient Inventory (EQ-i) (Bar-On, 2006). According to Macht et al. (2019), the EQ-i is one of the most prominent self-report mixed EI measures and has been applied by scholars such as Petrides and Furnham (2001), Van Rooy and Viswesvaran (2004) or Macht et al. (2019). The EQ-i measures an overall EI-quotient, as well for five composite

scales: interpersonal, intrapersonal, adaptability, general mood and stress management (Conte, 2005). Yet, as highlighted by Conte (2005) it is unclear how the five composites scales of the EQ-i are actually conceptually related to the overall EI-quotient. In the same vein, Joseph and Newman (2010b) criticized mixed EI models due to their still unknown content and theoretical value and consequently explicitly warned against the use of mixed EI measures. Roberts et al. (2001) supported this stance and argued that self-report tests typically measure a diverse constructs, including aspects of personality as well as the ability to perceive, assimilate, understand and manage emotions.

On the other hand, research conducted by Joseph and Newman (2010b) indicated that self-reported mixed EI measures might have stronger predictive power in regard to EI and job performance than performance-based EI tests. They concluded that mixed-based measures of EI can explain variance in job performance beyond cognitive ability and personality. In a subsequent paper, Joseph et al. (2015) added that this is because mixed EI measures reflect a heterogeneous combination of traits that have long been identified to be related to job performance.

2.4.4. Self-Rated Emotional Intelligence Scale to assess Self-Report Ability EI

The Self-Rated Emotional Intelligence Scale (SREIS) has been developed by Brackett et al. (2006). It is based on Mayer and Salovey's (1997) ability model of EI. The SREIS items have been created based on items of existing self-report scales, such as Trait Meta-Mood Scale (Salovey et al., 1995) or the self-report measure of EI by Schutte et al. (1998). It aims to predict psychological and subjective wellbeing (Bucich and MacCann, 2019). Though, so far the construct validity of the SREIS has not been examined by few studies,

such as Brackett et al. (2006). Hence it has not been considered applicable for this research.

2.4.5. Wong and Law Emotional Intelligence Scale to assess Self-Report Ability EI

The Wong and Law Emotional Intelligence Scale (WLEIS) is one of the most widely measures for EI (Kong, 2017). The initial motivation to develop the WLEIS, was the need for a simple, practical, and psychometric sound measure of EI that can be used for organizational research purposes, i.e. that can be applied on the workplace (Wong and Law, 2002).

The WLEIS contains four dimensions which Law et al. (2004) defined as:

1. *Appraisal and expression of emotion in oneself. (SEA)*

   This relate to an individual's ability to understand his or her deep emotions and to be able to express emotions naturally. People who have good ability in this area will sense and acknowledge their emotions better than most people.

2. *Appraisal and recognition of emotion in others. (OEA)*

   This relates to an individual's ability to perceive and understand the emotions of the people around them. People who rate highly in this ability will be very sensitive to the emotions of others as well as able to predict others' emotional responses.

3. *Use of emotion to facilitate performance. (UOE)*

   This relates to the ability of a person to make use of his or her emotions by directing them toward constructive activities and personal performance. A person who is highly capable in this dimension would be able to encourage him- or herself to do better continuously. He or she would also be able to direct his or her emotions in positive and productive directions.

4. *Regulation of emotion in oneself. (ROE)*

   This relates to the ability of a person to regulate his or her emotions, enabling a more rapid recovery from psychological distress. A person with high ability in this area would be able to return quickly to normal psychological states after rejoicing or being upset. Such a person would also have better control of his or her emotions and would be less likely to lose his or her temper.

Wong and Law (2002) originally referred to Mayer's (1997) definition of EI with its four distinct dimensions as conceptualization for the WLEIS. However, as clarified later by Law et al. (2004), the WLEIS is actually not based on Mayer's (1997) definition of EI but rather Davies et al. (1998) four-dimensional definition of EI. They justified their decision by stating that this definition is more representative of the entire EI literature, because it is not only quite similar to Mayer's (1997) Four Branch conceptualization of EI but also to Ciarrochi et al's. (2000) summary of the four basic areas of EI. Research conducted by Carvalho et al. (2016) indicated that similarities between the four factors used in the WLEIS and the Four-Branch Model indeed exists. Ng et al. (2007) hence confirmed that the four domains of WLEIS are in accordance with the schematic of Davies et al. (1998), which reflects Salovey and Mayer (1990) conceptualization. The original version of the

WLEIS is rated on a seven-point Likert scale, e.g. applied by Law et al. (2008) or Libbrecht et al. (2014). However, researchers, such as Joseph and Newman (2010a) or Chen et al. (2015) adopted the WLEIS to a five-point Likert scale, because this can reduce frustration level of the participants and thus increase the response rate and the quality of the response (Babakus and Mangold, 1992). Furthermore, the WLEIS has been applied in different languages other than the original English-version, such as in Chinese (Li et al., 2012, Law et al., 2004), in Dutch Libbrecht et al. (2014) or in Italian (Iliceto and Fino, 2017).

2.4.5.1. Distinct Validity of WLEIS to Big Five Personality Factors

The WLEIS is often labelled as a trait EI test, rather than a (self-report) ability EI test by scholars such as Ng et al. (2007), Brannick et al. (2009), Li et al. (2012), Carvalho et al. (2016), Kong (2017). This classification as a trait EI test is mainly based on Petrides and Furnham (2003) proposal that the distinction between the EI concepts should be made purely based on the measurement approach rather than the theoretical domains of the various EI conceptualism as illustrated above. A study conducted by Brannick et al. (2009) supported this view. In their study they compared a self-report and a performance ability measure of EI in medical students. The MSCEIT as performance ability measure and the WLEIS as self-report measure were selected, as both are based on Mayer and Salovey's (1990) Four Branch model of EI. Given the similarity of their definitions, good convergence between both measures would have been expected. However, they concluded that the MSCEIT and the WLEIS clearly measure different things, as they did not correlate highly with one another. Their results also indicated that WLEIS was more highly correlated with personal scales than MSCEIT. Doubts, on to which extend the WLEIS actually measures an actual ability rather than a trait have also been casts by Joseph and Newman (2010b).

For example, they argued that the four items to measure the use of emotions (UOE) within the WLEIS, such as “I always set goals for myself and then try my best to achieve them.” are actually related to address motivation rather than an ability. Though, as stated by Mayer et al. (2016), the ability “to facilitate thinking by drawing on emotions as motivational and substantive inputs” is an essential part of EI. Or as illustrated by Roberts et al. (2001), the use of emotions essentially is about weighting emotions against other emotions, sensation and thoughts and thus enabling them to direct attention, create self-monitoring and self-motivation.

On the other hand, Wong and Law (2002) reported a reasonable good fit for a nine-factor model, including the four WLEIS dimensions and the Big Five personality dimensions when assessing 116 non-teaching employees from a Hong Kong university. They concluded that their results indicate good convergent and discriminant validity between EI measured by WLEIS and the Big Five dimensions. Similarly, studies conducted by Law et al. (2004) indicated that EI measured by WLEIS is conceptually distinct from personality and therefore from trait EI.

2.4.5.2. WLEIS validated in different Cultures

The WLEIS has originally been developed in Hong Kong and validated on a large sample of Chinese supervisors and managers (Wong and Law, 2002). Libbrecht et al. (2014) thus highlighted the importance to examine whether the WLEIS is invariant across regions other than the Far Eastern region (China), where it was originally developed. In fact, since the introduction of the WLEIS, so far its internal consistency has been validated throughout many different cultures. For example, based on their results examining 628 international college students who were enrolled in the US and the demonstrated

acceptable factorial validity and reliability, Ng et al. (2007) recommended the use of WLEIS to investigate international student's EI. Iliceto and Fino (2017) translated the WLEIS into an Italian version, which they referred to as WLEIS-I and assessed 476 Italian participants. They reported significant internal consistency with Cronbach's α for the WLEIS total score of 0.88. Iliceto and Fino (2017) thus concluded that current research supports the cross-cultural generalizability of the WLEIS. Another example is Whitman et al. (2009), who assessed 921 applicants for the job of firefighters in a large south-eastern city in the US to examine the equivalence of WLEIS EI in regard to gender and ethnics, i.e. White, Blacks and Hispanics. The pattern of their results suggest that female and males tend to score about the same. In regard to ethnic differences, their results indicated statistically significant differences on the overall WLEIS score, i.e. White and Hispanics scored significant higher than Blacks. In a related study, Libbrecht et al. (2014) investigated WLEIS EI scores across two countries, namely Belgium and Singapore. Their results suggest that the measurement structure was generally invariant across both countries, except for UOE and therefore they concluded that the WLEIS is a promising tool to assess EI across countries.

2.4.5.3. WLEIS as Predictor for Job Performance

Despite of its critique, the WLEIS has been beneficial in examining various kinds of organizational research questions. For example Wong and Law (2002) provided exploratory evidence for the positive effect of the EI of leaders and followers on job performance and attitudes based on a population of middle and upper-level managers enrolled in a part-time management diploma course at a large Hong Kong University. Similar results have been reported by Chen et al. (2015), who applied the WLEIS among the employees of a research and development institution in Taiwan. Their research also

supported the stance that EI has a positive association with work performance. In addition, they shed light on that perceived leader's transformational leadership positively moderated the relationship between subordinate's EI and work performance. Trivellas et al. (2013) assessed EI with WLEIS to investigate the impact of EI at the workplace on job satisfaction and turnover intentions of nursing stuff working in hospitals. Their results indicated that among the four EI dimension, only SEA and UOE showed significant positive impacts on employees' satisfaction with personal development, while also being negatively correlated with turnover intentions. Though, they also highlighted that no association could be verified for the EI components OEA and ROE on job satisfaction and turnover intentions. In another study, Law et al. (2008) found evidence that EI is a significant predictor of job performance beyond the effect of the General Mental Ability battery on performance when assessing research and development scientist in China. They even stated that EI measured by WLEIS, which originally has been developed in China, is a better predictor of job performance than the MSCEIT, which is a scale developed in the US, at least when assessing research and development scientist in China.

2.4.5.4. Selection of WLEIS for this research

As concluded by Brannick et al. (2009), the WLEIS has many advantages, such as the fact that it is relatively short, including only 16 items, designed to be applied on working population, free to administer and described to be relatively independent of personality traits. In comparison to other EI measures, it is a promising tool because of its brevity and its demonstrated psychometric properties (Ng et al., 2007). Furthermore, as illustrated above, the WLEIS has been validated in different cultural settings as well as to be a good

predictor for job performance. As a result, the WLEIS has been selected as appropriate instrument to measure EI for this research.

2.5. Hypotheses Development and Conceptual Model

The following sections continue the literature review with a focus on reported human related challenges caused by agile practices. When reviewing the literature, different themes of challenges were repeatedly reported. The identified challenges have thus been grouped into four main dimensions: anxiety, motivation, communication and mutual trust. The identified challenges are then associated to EI and as a result the hypotheses and the proposed conceptual model is presented.

2.5.1. Anxiety caused by Agile Practices

Individuals can experience negative psychological states, such as anxiety, because they ineffectively interpret emotional stimuli, set inappropriate goals, implement ineffective coping strategies or fail to employ appropriate emotion regulation skills (Thomas et al., 2017). For this research, anxiety is defined as “a negative psycho-emotional state that results when fear of events, which are not always identifiable, manifests as an exaggerated response where nervousness and worry predominate” (Castro-Sánchez et al., 2019).

This also applies to IS-professionals as they encounter numerous obstacles in their effort to successfully complete their assigned tasks and these challenges increase levels of stress, which subsequently affect their ability to self-regulate their feelings and understanding (Rezvani and Khosravi, 2019). For example, some agile team members

experience fear that is caused by the transparency of their skill deficiencies, because agile practices, such as daily stand-up meetings, onsite customers or the use of storyboards require direct and constant communication and collaboration (Conboy et al., 2011). Similar cases have been reported by Lalsing et al. (2012), where team members did not raised concerns regarding their technical deficits in order to avoid revealing that they were technically behind other team members. Furthermore, many developers feel a strong temptation to always say “yes” to avoid appearing less competent than other team members, even if they know that they cannot deliver a certain task in a given time (Kovitz, 2003). Furthermore, some agile team members, particularly junior team members, might feel scared to make estimates, velocity or product backlog, because they are afraid to be perceived as incompetent for potentially making wrong estimates (Dorairaj et al., 2012). It has also has been pointed out that agile team members might even try to avoid arguing in order to conform to other team members, although this behavior is preventing effective decision-making (Moe et al., 2012). In addition, agile team members might also feel worried about adapting to the new agile methodology, i.e. that they might feel unsecure whether they can adapt adequately to this new methodology and having concerns, about how other team members might judge them (Javdani Gandomani and Ziaei Nafchi, 2016).

The ability to regulate one’s own emotions can decrease undesired emotional impact on job performance, i.e. people can rise above negative perceptions quickly and thus their performance will be impacted less (Law et al., 2008). For example, when spiked by aggressive customer behavior, being able to regulate emotions is important to the long term health and retention of IS-professionals (Shih et al., 2014). Individuals with this ability also present a wider repertoire of strategies for maintaining positive emotions and for reducing or modifying negative emotions (Martínez-Monteagudo et al., 2019).

Furthermore, this ability has also been found to buffer the impact of cognitive test anxiety in academic achievements (Thomas et al., 2017). Consequently, following hypothesis is proposed:

H1a The ability to regulate one's own emotions has a causal effect on anxiety perceived by agile team members.

2.5.2. MOTIVATION TO APPLY AGILE

Agile transformation requires staff to be ready and willing to transform (Conboy and Carroll, 2019). Motivation has therefore been recognized as a key success factor for software projects (Sharp et al., 2009) and consequently low motivation can cause failure of software engineering endeavors (Pankratz and Basten, 2017). For this research motivation is defined as "initiation, direction, intensity and persistence of behavior" (Sharp et al., 2009).

On the one hand, recent studies indicate that motivation of agile teams is even significant higher than of plan-driven teams (Kakar, 2017). They argued that this is due to self-organization, which is positively related to motivation because it stimulates greater team member involvement and participation, resulting in higher commitment and motivation. On the other hand, motivation has also been increasingly cited as a particularly pernicious people problem in software engineering (Sharp et al., 2009). For example, Conboy et al. (2011) reported that some agile team members perceived the adoption of agile methods as overly onerous, complex and time-consuming. Although, possessing the competence,

they were not convinced that agile will work and hence lacked motivation to apply agile practices. This was particularly prominent in companies that adopted agile methods top-down. A lack of enough motivation can also be a hidden reasons why some agile team members are indifferent to adopt agile methods in their organizations (Javdani Gandomani and Ziaei Nafchi, 2016). Another aspect has been highlighted by Lalsing et al. (2012), who reported that agile team members might suffer from motivation issues, when tasks are assigned to them that they do not perceive as challenging enough.

Law et al. (2008) associated motivation with the ability to use emotions to facilitate performance. They argued that people with strong learned goal-seeking behaviors are able to make use of their emotions in order to direct their behaviors to achieve their goals. In a similar vein, Mayer et al. (2016) stated that EI includes the ability to facilitate thinking by drawing on emotions as motivational and substantive inputs. In regard to team EI, Barczak et al. (2010) stated that teams with higher EI are better to inspire support and confidence in fellow team members. As a result, following hypothesis is proposed:

H2a The ability to use emotions has a causal effect on motivation challenges perceived by agile team members.

Teams with higher ability to monitor and regulate their emotions are more likely to motivate themselves (Barczak et al., 2010). Similarly, research conducted by Christie et al. (2007) revealed that individuals with higher perceived ability to regulate their emotions are more likely to report being motivated by achievement needs. Accordingly, below hypothesis is proposed:

H2b The ability to regulate emotions has a causal effect on motivation challenges perceived by agile team members.

2.5.3. Communication Competence

In agile projects, close and frequent communication among team members substitutes predetermined plans, such as used in traditional management approaches (Thorgren and Caiman, 2019) and therefore hurdles in communication can in turn have a negative impact on the efficiency of agile practices (Pikkarainen et al., 2008) and several dependent functionalities, such as the communication of requirements or queries (Lalsing et al., 2012). The importance of communication competence throughout the entire agile project has thus been highlighted by many scholars (Lalsing et al., 2012, Hummel et al., 2013, Ghobadi and Mathiassen, 2016, Dingsoeyr et al., 2019). Likewise, Pedersen (2013) shed light on the importance of communication with the client as it continues throughout the development process. For example, customers are given demonstrations of solution after each iteration and their feedback is used as the basics for the next course in action. Great emphasis is also placed on communication involving diverse stakeholders through practices such as joint-application design sessions and customer focus groups (Ghobadi and Mathiassen, 2016). This research has chosen a definition of communication competence proposed by McCroskey (1988) as “adequate ability to pass along or give information; the ability to make known by talking or writing”.

In agile projects, knowledge is considered to be social constructed and collectively held, because verbal communication is considered to be more effective in sharing concepts, ideas or desires, as it allows rapid mutual feedback and also stimulate further thinking, by transforming and reshaping thoughts and drawing new implications from them (Melnik and

Maurer, 2004). Agile practices primarily rely on face to face conversations between team members for knowledge sharing through practices such as retrospectives and pair programming rather than just source code (Kovitz, 2003, Dingsoeyr et al., 2019). They are therefore shifting communication from the traditional paradigm, including documentation, plans and models towards more informal communication (Hummel et al., 2013). A related aspect has been pointed out by Begel and Nagappan (2007), who stated that within an agile context social cliques may become the dominant means of communication and that those with poor interpersonal skills might be excluded from these cliques and thus from important communication as well.

Yet, in order to successfully transfer tacit knowledge, the agile team members need to possess a multitude of characteristics, such as empathy and the ability to articulate and communicate enough (Takpuie and Tanner, 2016). However, IS-professionals have been reported to be an introverted personality type (Beecham et al., 2008, Hendon et al., 2017), who enjoys working alone and may get overwhelmed with too much social interactions (Sharp et al., 2009, Shih et al., 2014). They have also been characterized to have no desire to interact with customers (Shih et al., 2014) and who typically have difficulties in communicating because their actions are based on what they think rather than on what somebody else feels (Capretz, 2003). Yet, whenever team members work together, emotions grow out of social interactions and thus have a pervasive influence in establishing a collaborative environment, where team members are encouraged to embrace change and to openly share and discuss their individual viewpoints, share knowledge and learn from each other (Barczak et al., 2010). Furthermore, emotions convey information and therefore function as communication signals, such as happiness is a signal of wanting to join with others or sadness is a signal of loss and wanting of

comfort (Mayer et al., 2008b). Therefore, scholars have shed light on the relation between EI and communication competence, such as effective communication requires the management and recognition of one's own and others' emotional expression (Troth et al., 2012a) or the ability to understand emotions contributes to developing communication skills (Petrovici and Dobrescu, 2014). In a similar vein, George (2000) argued that in order to effectively communicate with other people about one own needs and concerns it is necessary to accurate appraise and express emotions of one's self and others'. Consequently, the following hypotheses are proposed:

H3a The ability to appraise and recognize emotions in one's self has a causal effect on communication challenges perceived by agile team members.

H3b The ability to appraise and recognize emotions in others has a causal effect on communication challenges perceived by agile team members.

H3c The ability to regulate emotions has a causal effect on communication challenges perceived by agile team members.

2.5.4. Lack of Mutual Trust

Mutual trust is one of the most influential key factors in regard to agile team performance (Lalsing et al., 2012) and a predictor for project performance and project effectiveness (Rezvani et al., 2016). For this research, trust will be understood as "a psychological state comprising of the intention to accept vulnerability based upon positive expectations of the intentions of behaviors of another" (Rousseau et al., 1998).

Yet, trust can be challenging in agile teams. For example team members might be reluctant to assign certain tasks to other team members, because they have concerns if they can accomplish them in an effective manner and on time and thus assign the tasks to themselves and as a consequence cause delays in other areas (Lalsing et al., 2012). Likewise, Henttonen and Blomqvist (2005) argued that trust is an important component in team development and effectiveness, because team members are less willing to contribute and cooperate if there is a lack of trust. In particular, at the start of a project, a lack of familiarity between the team members can be an impediment for collaboration and communication (Lalsing et al., 2012). Another aspect that impedes the building of trust are cultural issues (Javdani Gandomani and Ziaei Nafchi, 2016). As illustrated by Dorairaj et al. (2012), cultural differences include the accent and rapidness of verbal communication, body language and also actual meaning for the spoken word. For example, words might have different meanings in different cultures. Replying with “yes” by an Indian team member might mean “Yes, I heard you.” However, an American team member might perceived it as “Yes, it is done”. This lack of cultural understanding impedes significantly the building of trust and bonding among the team members.

In fact, as stated by Barczak et al. (2010) team trust is mainly build on both, emotional bonds and perceived competencies of individual team members. They argued that when team members manage their own emotions and those of their peers, they are more likely to be trusted and relied on for their competence and ability. Besides, when team members are aware of their own emotions they can easier emphasize with their peers and provide

support and consequently creating more team trust. Accordingly, below hypothesis can be formulated:

H4a The ability to regulate emotions has a causal effect on mutual trust challenges perceived by agile team members.

H4b The ability to appraise and recognize emotions in one's self has a causal effect on mutual trust challenges perceived by agile team members.

The ability to appraise and recognize other people's emotions, as claimed by Law et al. (2008), will assist in being accepted by others, earning their trust and gaining their collaboration. As a result, below hypothesis can be formulated:

H4c The ability to appraise and recognize other people's emotions has a causal effect on mutual trust challenges perceived by agile team members.

2.5.5. Proposed Conceptual Model

An overview of the nine proposed hypothesis is presented in the conceptual model in Figure 4. The purpose of this research is to examine causal inferences between EI and human related challenges perceived by agile team members.

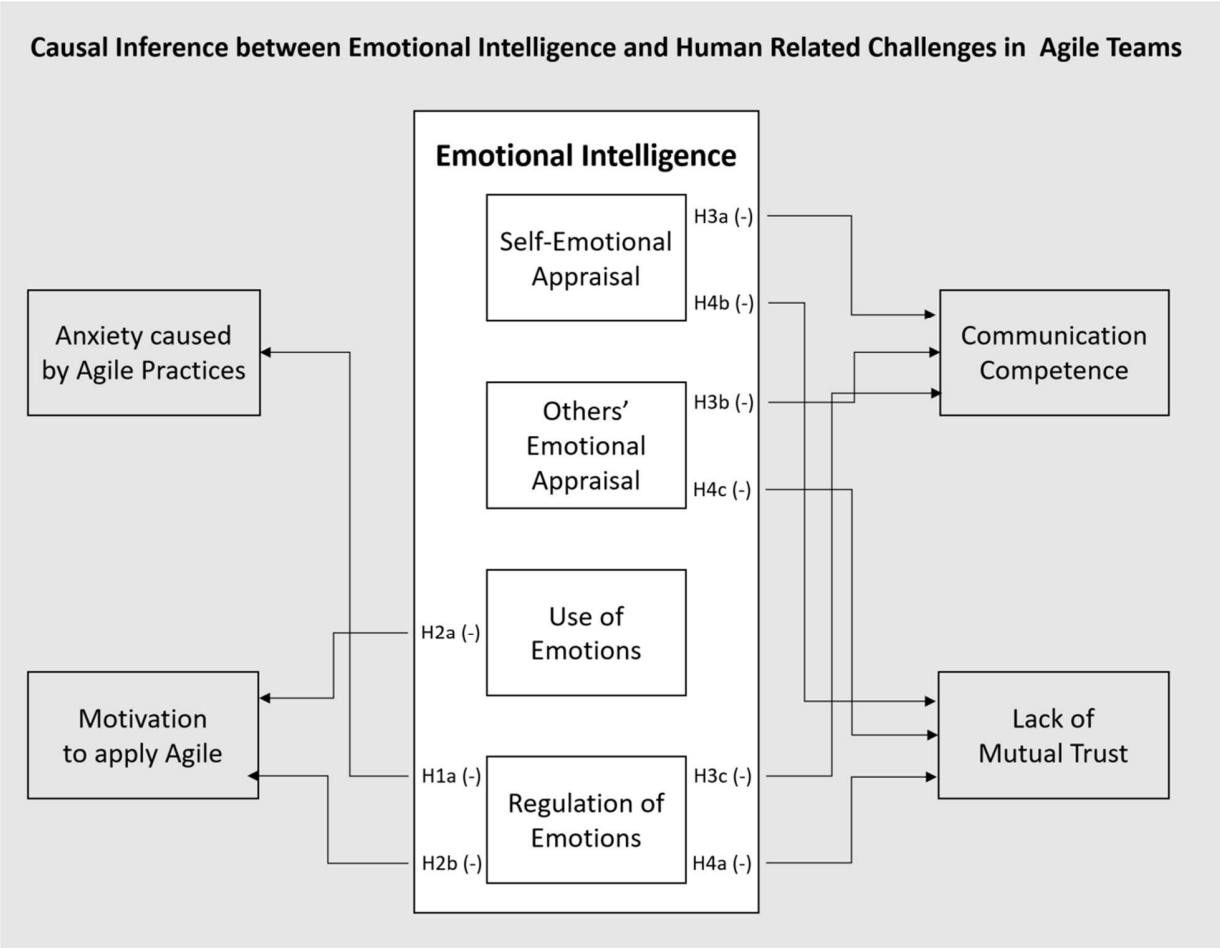

Figure 4 Proposed Conceptual model (author)

2.6. Chapter Summary

Chapter 2 provided a thorough review of the literature. It began with contrasting plan-driven and agile project management methodologies. Plan-driven project management methodologies have been criticized of not being able to cope with the increasing complexity of today's dynamic software development. As a response, agile project management methodologies have been introduced in order to enable software developers to better adapt to volatile user demands, by facilitating customer involvement and flexible design. Though, despite of the success of agile managed projects, software developers

are getting frustrated with the increase reliance on social skills caused by agile practices. If fact, software developers have been frequently reported to be an introverted personality type with low need for social interaction and a preference for working alone. Yet, this individual characteristics are in contrast to agile practices, which are human-centric and rely on social interaction and collaboration.

The chapter continued with an overview of the various models of EI: ability EI, mixed EI and trait EI and their corresponding assessment tools. The Wong and Law Emotional Intelligence Scale has then been discussed in more detail and it has been explained why it has been selected for this research. The WLEIS has been designed to be applied in the work place and various studies have indicated that it is a good predictor of job performance. Besides, it has proven solid construct validity across different cultures and distinct validity to the Big Five personality factors. Then, this chapter has given an overview about the key human related challenges that occur in agile teams. For example, some software engineers experience fear that is caused by increasing transparency of their skill deficits and others lack the motivation to apply agile techniques. This chapter also highlighted the importance of communication, as in agile teams knowledge is considered to be social constructed and collectively held rather than mainly relying on documentation. Another reoccurring key challenge is a lack of mutual trust between agile team members, e.g. caused by a lack of familiarity or cultural differences. The identified key challenges have then been all associated to different dimension of EI in order to arrive at the proposed hypotheses and the conceptual model.

3. CHAPTER 3: RESEACH METHODOLOGY

3.1. Introduction

In chapter 2, the literature has been reviewed and as a result the proposed hypotheses and the conceptual model have been presented. In this chapter, the research methodology is developed. As the research design is influenced by philosophical considerations, chapter 3 begins with outlining the researcher's ontological and epistemological position, which are subjectivism and pragmatism. This is then followed by developing the research design. Research design elements, such as the research purpose, the research strategy or the stages of the research process are discussed. After this, the three research methodologies: quantitative, qualitative and mixed research are contrasted. The key elements for this quantitative research are illustrated afterwards, including the target population, the sample technique and the structure of the questionnaire. Finally, the options for statistical data analyzing are discussed and as a result, Propensity Score Matching has been selected to measure the impact of EI on the perceived challenges.

This chapter is structured as follows. It begins with presenting the research paradigm in section 3.2. In section 3.3, the research design is described. In section 3.4 the questionnaire development and validation process is illustrated. This is followed by section 3.5, which presents the elements of the applied quantitative research method. Then in section 3.6 Propensity Score Matching as mean to indicate causal inference in observational studies is discussed. Information about the research ethics are presented in section 3.7. Finally, section 3.8 provides an overview of the overall chapter.

3.2. Research Paradigm

When conducting any research, it is important to clearly outline the philosophical paradigm for claiming to know what we know (D O'Gorman, 2014). Hence, this chapter outlines the researcher's ontological and epistemological position, as well as the research approach to theory.

3.2.1. Ontological and Epistemological considerations

The justification about an applied research design is closely related to an author's philosophical stand, in terms of his understanding of *what is* (ontology) and *what it means to know* (epistemology) (Crotty, 1998).

Ontology is concerned with the beliefs of the researcher about the nature of what is to know in the social world (Rose et al., 2014). Two notable, but opposing ontological views are objectivism and subjectivism. Objectivism views things, such as organizations or social entities as existing in reality external to and independent of social actors (Saunders et al., 2012). In contrast to this, subjectivism views the same things to be social constructed products, based on the perceptions and actions of social actors (Bryman, 2015). Subjectivism is thus often associated with constructionism, which views reality to be socially constructed (Saunders et al., 2012). This research is interested in the perception of IS-professionals working in agile teams. The researcher is thus akin to subjectivism.

Epistemology is concerned with determining what kind of knowledge is possible and how it can be ensured that it is both adequate and legitimate (Crotty, 1998). Hence, one central concern of epistemology is whether the social world can and should be studied according

the same principles, procedures and ethos as the natural sciences (Bryman, 2015). Hence, researchers who are akin to the position of natural sciences adopt the epistemology of positivism. Positivism assumes that there is a neutral point at which the external world can be observed objectively (Johnson and Duberley, 2003). Accordingly, positivistic research should be undertaken, as far as possible, in a value-free way (Saunders et al., 2012) and researchers are required to keep the distinction between objective, empirically verifiable knowledge and subjective, unverifiable knowledge (Crotty, 1998). A contrasting epistemology is interpretivism. Researchers, who are akin to interpretivism belief that the objects to be studied by social science, i.e. people and their institutions, are fundamentally different from objects studied in natural science (Bryman, 2015). Humans are understood as social actors, who play a part in the stage of human life (Saunders et al., 2012). Interpretivist thus attempt to study the social world by means of culturally derived and historically situated interpretations, i.e. meaning is created by the engagement of individuals with their reality and consequently different people might construct different meanings for the same phenomena (Crotty, 1998). Another notable epistemology is pragmatism. Pragmatists are concerned with whether something, be it philosophical assumptions, methodology, or information is useful in the sense that it can be instrumental in producing the desired result (Goles and Hirschheim, 2000). Pragmatism recognizes that there are many different ways of interpreting the world and undertaking research and therefore it is perfectly possible to work with different philosophical positions, as long as the applied methodology enables the collection of credible, well-founded, reliable data and advances research (Saunders et al., 2012). In light of the above discussion, the author situates himself within a pragmatic philosophical epistemology.

Epistemological and ontological assumptions combined in different ways can form alternative philosophical paradigms (Rose et al., 2014). A paradigm is a cluster of beliefs and dictates which influence what should be studied, how research should be conducted and how the results should be interpreted (Bryman, 2015). Most notable are the four paradigms introduced by Burrell and Morgan (2005): functionalist, interpretative, radical humanist and radical structuralist. As described by Bryman (2015), the functionalist paradigm is the dominant framework for organization studies. It is based on a problem-solving orientation which results in rational explanations. The interpretative paradigm focuses on those who work in organizations, i.e. the experience of social actors. The radical humanist paradigm suggests that individuals need to be emancipated from their organizations and that research should be guided by the need to change. Finally, the radical structuralist paradigm views organizations as a construct of power relationships, which result in conflicts.

The main focus of this research is to explore how subjectively IS-professionals experience working in agile teams. The author would therefore classify himself as being akin to the interpretative paradigm, because research based on an interpretative paradigm, focuses on consciousness and subjectivity of the individual (Goles and Hirschheim, 2000).

3.2.2. Research Approach to Theory

The extent to which a researcher is clear about the role of theory at the beginning of his research is an important question concerning how he will approach his research (Saunders et al., 2012). The main research approaches are deductive, inductive and abductive. As outlined by Bryman (2015), when applying a deductive approach, hypotheses are deduces based on an existing theory and then subjected to empirical

scrutiny by gathering data and testing the hypotheses. Inductive research refers to approaching a research question from the opposite direction that is the researcher infers the implications of his research back into existing theory. However, as stated by Saunders et al. (2012), deductive and inductive should be better thought of tendencies rather than as strict distinctions and hence both can be combined within the same research. This approach is then referred to as an abductive approach. As illustrated by Bryman (2015), abduction starts with a puzzle that current theory cannot explain. Abductive reasoning then seeks to identify the conditions that would make the phenomena less puzzling, by engaging with the literature for theoretical ideas as well as with the social world as an empirical source.

In light of the above discussion, the research approach for this study is deductive research. Based on existing theories, hypotheses are developed and then tested using empirical data.

3.3. Research Design

A research design provides the framework for collecting and analyzing data and therefore reflects decisions about the priorities of a research, such as expressing causal interferences, generalization or understanding behavior in a certain social context (Bryman, 2015). It includes components, such as the objectives derived from the research questions, the sources for data collection and the method to analyze the data (Saunders et al., 2012). The key elements of the design for this research are illustrated below.

3.3.1. Research Purpose

The purpose of a research can either be exploratory, descriptive or explanatory or a combination of these (Robson and McCartan, 2016). As illustrated by Saunders et al. (2012), exploratory research is applied, when the researcher is trying to discover what is happening and attempts to gain insights about a topic of interest. Descriptive research is trying to gain an accurate profile of events, persons or situations. Research that attempts to establish causal relationships is referred to as explanatory research.

The purpose for this research is of explanatory nature, because it is trying to examine a causal relationship between human related challenges perceived by IS-professionals working in agile managed teams.

3.3.2. Unit of Analysis

This research targets to examine human related challenges occurring in agile managed teams. As such, the unit of analysis for this research are any IS-professionals who work in agile managed teams.

3.3.3. Research Data

The backbone of each research is the collection of data, which the researcher has identified as worthy to analyze (D O'Gorman, 2014). The two main types of research data that exists are primary and secondary data (Collis and Hussey, 2003). As illustrated by Saunders et al. (2012), data that is collected new for a specific research purpose is referred to as primary data. Data that originally has been collected for some other research purpose is known as secondary data and can include both raw data and published summaries. The decision of either using primary or secondary data is very much

dependent on the research question itself, but also influenced by economical, time or other constraints. For this research new data will be collected and therefore primary data will be used.

3.3.4. Research Strategy

A research strategy can be defined as a plan how the researcher attempts to answer the research question and therefore it is the methodological link between his philosophical position and subsequent choice of how he will collect and analyze data (Saunders et al., 2012). The two most prominent research strategies are quantitative and qualitative research.

Quantitative research can be described as quantifying a research problem and understanding how widespread it is, by seeking projectable outcomes for a larger population (D O'Gorman, 2014). Hence, it exhibits a deductive view in regard to the relationship between theory and research and an objectivistic conception of social reality (Bryman, 2015). Quantitative research focus on examining the relationship between numeric variables by analyzing using statistical techniques, such as survey research or structured interviews (Saunders et al., 2012). In contrast to this, qualitative research emphasizes words rather than numeric data collection and qualitative researchers are hence more akin to an interpretivist epistemological position and constructionist ontological position (Bryman, 2015). Qualitative research focus on examining participants' meanings and the relationship between them by applying data collection techniques that are of non-standardized so that questions and procedures may alter and emerge during the research process, such as action research, ethnography or Grounded Theory (Saunders et al., 2012).

The selection of the research strategy is guided by the research question and the coherence with which it links to the researchers philosophical stance, the research objectives and also pragmatic constraints, such as the amount of time and resources available (Saunders et al., 2012). For example, constructivism and poststructuralism are connected to qualitative research and postpositivism to quantitative research (Johnson et al., 2007). In fact, most IS-research appears to be data driven and thus guided by positivism (Goles and Hirschheim, 2000). Likewise, as outlined by Saunders et al. (2012), in generally quantitative research is associated with positivism and a deductive research approach and qualitative research is associated with interpretivism and an inductive research approach. Though, the connections between epistemological and ontological assumptions and the research design should not be viewed as fixed and ineluctable, but rather as tendencies and hence the selection of the research strategy should therefore be more independent of epistemological and ontological assumptions than is often supposed (Bryman, 2015). Additional factors, such as economic concerns, time constraints or stakeholder interests should also be taken into account when selecting the appropriate research strategy, as suggested by Hesse-Biber (2010).

Combining quantitative and qualitative research design, also referred to as multiple or mixed methods research design, is thus becoming increasingly articulated as the third major approach, along with quantitative and qualitative research (Johnson et al., 2007). Mixed method research is often associated to pragmatism, because pragmatists value both, qualitative and quantitative research methods and the nature of the research question should be the driving force to determine the most appropriate methodological choice (Saunders et al., 2012). Green (1989) identified five benefits of mixed method designs, which include: triangulation, complementarity, development, initiation and

expansion. Triangulation refers to using more than one research methods in the study of a social phenomenon in order to improve confidence in the findings (Bryman, 2015). Complementarity allows the researcher to make use of both, quantitative and qualitative data within the same research. The benefits for the researcher is that it enables him to cross-validate the collected data and also therefore strengthen the validity of his study (Hesse-Biber, 2010). Development refers to applying different methods, by enabling one method to incrementally built on the results obtained by the previous method (Kuada, 2012). When the findings of a study raise questions or contradiction that lead to new research questions, then this is referred to as initiation and expansion intends to extend the breadth and range of an inquiry (Hesse-Biber, 2010).

There are different ways to combine quantitative and qualitative research methods into mixed methods research. An often referred typology that has been introduced by Creswell (2011) are the four basic mixed method designs: convergent parallel, exploratory sequential, explanatory sequential and embedded. As illustrated by Bryman (2015), convergent parallel design entails the simultaneous collection of quantitative and qualitative data, which have equal priority. The exploratory sequential design entails the collection of qualitative data prior to quantitative data. When applying explanatory sequential design, quantitative data is collected first, followed by qualitative data. Finally, embedded design can have either quantitative or qualitative research as the priority approach, but also applies the other approach within the same research study.

This research made use of surveys in order to collect quantitative data that are then examined using statistical analysis. As no qualitative data has been collected, this

research can hence be classified to be quantitative research. Figure 5 illustrates the complete research design for this study.

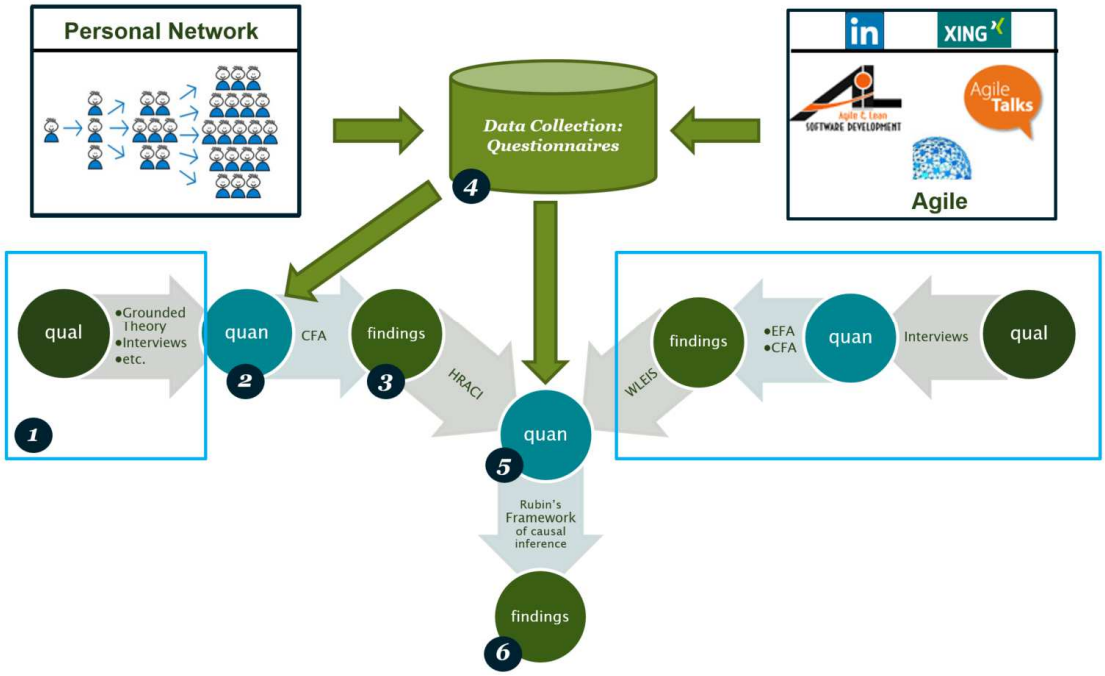

Figure 5 Research design (author)

The blue boxes in Figure 5 indicate that this research builds on research previously conducted by other scholars, using qualitative as well as quantitative research methods. For example, it utilizes the WLEIS developed by Wong and Law (2002) in order to measure the EI of the agile team members. The WLEIS survey items have been generated by interviewing managers and students to generate self-reported items for each dimension of EI as stated by Wong and Law (2002). These items have then been validated using quantitative statistical methods, such as Exploratory Factor Analysis (EFA) or Confirmatory Factor Analysis (CFA). In order to measure the human related challenges perceived by agile team members, as new assessment tool, the Human Resource Agile Challenges Indicator (HRACI) had to be designed and validated. In step 1, the HRACI

survey items have been generated based on human related challenges perceived by agile team members that have already been reported by other scholars using qualitative research methods, such as Grounded Theory by Javdani Gandomani and Ziaei Nafchi (2016) or focus group discussion by Conboy et al. (2011). By means of a pilot study internal validity and construct validity of the proposed dimensions of the HRACI and the WLEIS have been validated with Cronbach's alphas and Confirmatory Factor Analysis (CFA) in step 2 and 3. During the pilot phase data has been collected by approaching agile practitioners within the personal network of the researcher, as well as via the business network LinkedIn. After the pilot study, the main data collection in step 4 has been conducted. The collected data has then been analyzed in step 5 by means of Rubin's Causal Model, in order to examine causal inference between the perceived challenges and the EI of the agile team members.

3.3.5. TIME HORIZON

The time horizon for a research can either be cross-sectional or longitudinal. Cross-sectional research examines a particularly phenomenon at a particular time (Saunders et al., 2012). In contrast to this, a longitudinal study surveys a sample and then surveys it again on at least one further occasion (Bryman, 2015). In regard to this research, the participants would be required to complete a survey at least twice, e.g. before and after an EI-training. Yet, the cost of special EI-training a very high and thus not feasible for this research. Hence, due to the time and costs involved when conducting longitudinal research, they are relatively little used in business and management research (Bryman, 2015) and for the same reasons, this research will conduct cross-sectional research.

3.3.6. Stages of the Research Process

This section provides on overview, about how this research has been initiated and which stages were completed to accomplish this research. The complete research process as well as the corresponding chapters for each stage are presented in Figure 6.

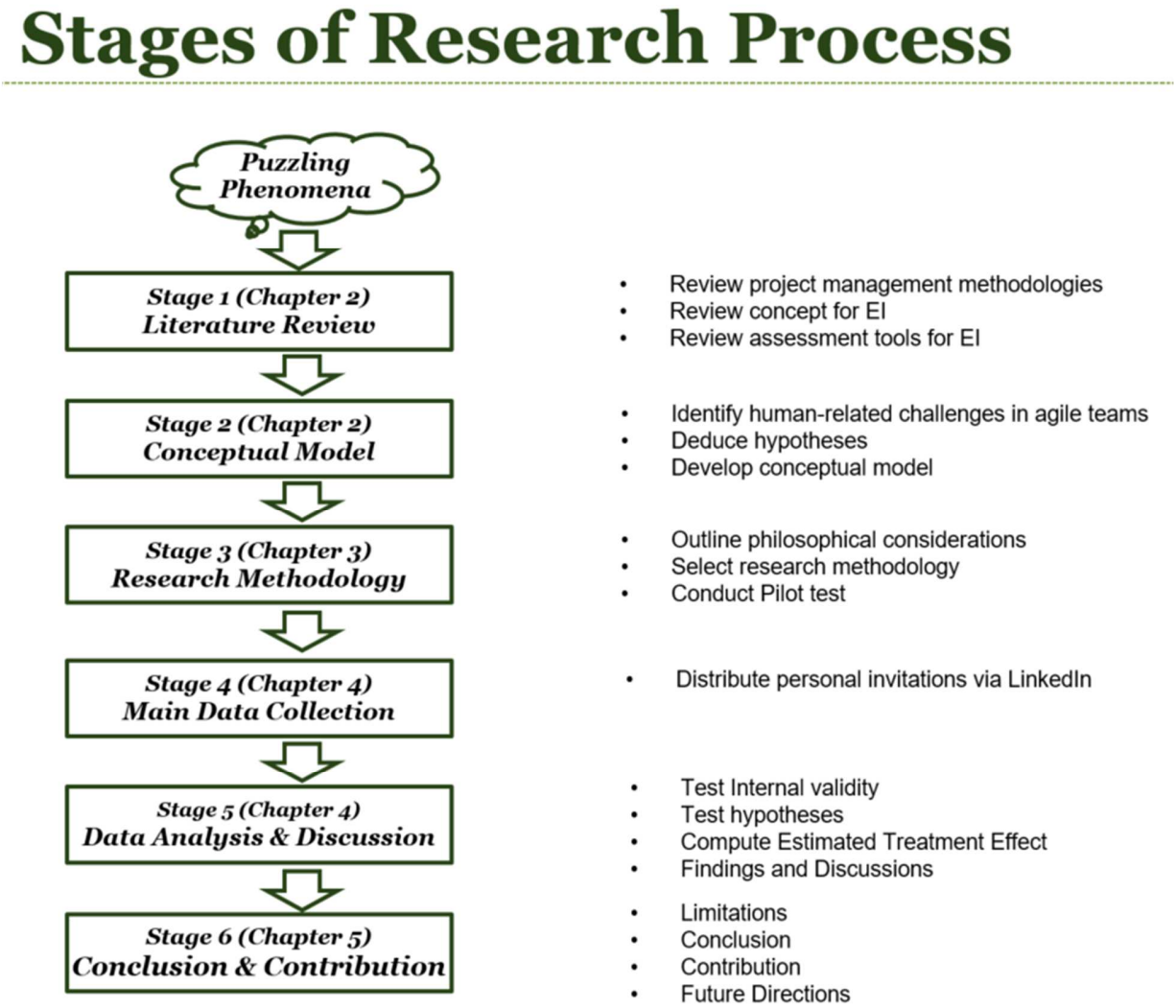

Figure 6 Stages of the Research Process (author)

The research process started with a puzzling phenomenon that the researcher experienced when working as senior solution architect for an Indian software company.

When managing agile teams, he experienced that some of his team members were perceiving human related challenges, such as issues with communication and motivation. These challenges had a crucial negative impact on the team performance and project success. This research started with the researcher trying to understand, explain and resolve this phenomena.

In stage one, a comprehensive literature review has been conducted to contrast plan-driven and agile project management methodologies. The literature has also been reviewed to discuss the available concepts and assessment tools for EI. In stage two, the hypotheses and conceptual model has been developed. This stage started with identifying human related challenges perceived by agile team members reported by other scholars. These challenges have then been associated to EI.

In order to empirical test the hypotheses, a suitable research design had to be developed in stage three. The research design was primarily guided by the research objectives, but also by the researcher's philosophical stance. The research design included the selection of survey research as the most suitable research method for this research. In order to conduct the survey, the required assessment instruments had to be selected or even new designed, if they did not already exists. In addition, a website was created in order to publish the survey. A pilot study was then conducted in order to ensure internal validity of the survey items before starting the main data collection.

Stage four includes the main data collection. Personal invitations were distributed via the business network LinkedIn. In total 454 valid responses were collected. During stage five, the collected dataset has then been analyzed, by applying the analytical methods defined

in the research design. The data has been analyzed in regard to internal validity as well as to empirical test the proposed hypotheses. For hypotheses which could be confirmed with significant correlations, also the Average Treatment Effect using Propensity Score Matching has been computed. Finally, the revised conceptual model is presented and the findings are discussed.

In stage six, the conclusions are presented. Stage six also includes the contribution of this research to theory and practice as well as the limitations and future research directions of this research.

3.4. Questionnaire Development and Validation

3.4.1. Overview

This research examined a possible causal inference between challenges perceived by agile team members and their EI. In order to test these two construct, two assessments instruments were required. In order to assess the EI of the participants, the WLEIS has been selected, as it has proven to be a valid instrument as discussed in section 2.4.5.4. However, so far, no instrument has yet been designed to measure the degree of perceived challenges by agile team members. Consequently, the Human Related Agile Challenges Inventory (HRACI) had to be developed.

The research questions required a quite broad definition of the target population. In fact, it was important to reach out for participants with a variety of personal attributes, such as gender, age or nationality, in order to investigate their influence of these characteristics on EI. Consequently, any agile team members who had experienced agile project management practices was welcome to participate in this research. The participation was

anonymous, voluntary and without any compensation. Between 09th June and 26rd October 2018, almost 8.000 personal invitations were send via the business networks LinkedIn or XING and via the personal network of the researcher via email. Figure 7 illustrates an invitation sent via LinkedIn.

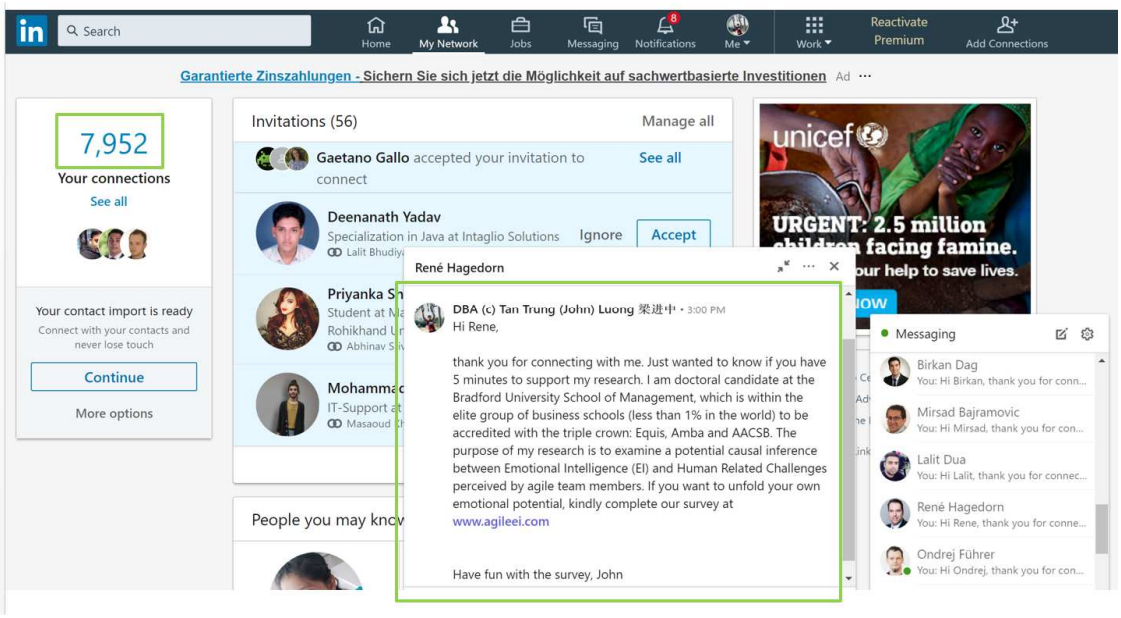

Figure 7 Invitations send via LinkedIn

777 followed the invitation and visited the website which could be accessed via www.agileei.com. The website referred to a google forms web survey, which included the HRACI as well as the WLEIS.

3.4.2. Involvement of Practitioners

The importance to involve practitioners throughout the entire knowledge creation process has been highlighted by many scholars (Tranfield et al., 2003, Bansal et al., 2012, Scott et al., 2012, Bartunek and Rynes, 2014). In particular, as emphasized by Cunliffe and Scaratti (2017), the awareness and the utilization of the situated knowledge possessed

by the practitioners is viable for the entire research process. This situated knowledge can actually only be created, developed and possessed by practitioners, who have to deal with and try to resolve organizational issues and experiencing their impact on organizational behavior on a daily basis. This situated knowledge is what actually makes practitioners so valuable for academic researchers, who can only learn and try to understand about organizational challenges by reading the literature or in the dialogue with practitioners. Though, without experiencing these challenges it is difficult to develop a comprehensive understanding about them.

In order to improve this aspect, a panel of experts has been installed for this research. The panel consisted of five agile practitioners, which were personal known by the researcher. As the selected experts were all experienced and knowledgeable with agile methodologies the group of five was sufficient. Their advice and feedback have been requested in particular during the initial design of the HRACI questionnaire items as well as during the pilot study, when the HRACI had to be altered due to low Cronbach alpha values. The feedback has been gathered either via face-to-face meetings or telephone calls.

3.4.3. Structure of the Questionnaire

The questionnaire was in English language and contained four sections. The first section stated the participants' information, such as the purpose and benefits of this research, as well as the procedure and risks when participating in this research. Furthermore, the potential participant was ensured confidentiality (see appendix 1). The second section contained seven multiple choice questions with single answers related to the participants' characteristics, i.e. gender, cultural background, educational background, age, whether

they had received EI training in the past, in which project management methodology they mainly work and their role in the agile team (see appendix 1). The third and fourth section contained the WLEIS and HRACI, which will be detailed below.

3.4.3.1. Structure of the WLEIS

The WLEIS was assessed by means of a 5-point Likert-scale in the four dimensions: Appraisal and expression of emotions in oneself (SEA), appraisal and recognition of emotions in others (OEA), use of emotions to facilitate performance (UOE) and regulation on oneself (ROE). Each dimension had four indicators (see appendix 2).

3.4.3.2. Structure of the HRACI

The HRACI builds on previous research and contains the four dimensions: anxiety (ANX), motivation (MOT), communication (COM) and mutual trust (TRU). Each dimension had three indicators. All indicators have been assessed by means of a 5-point Likert-scale (see appendix 3).

In order to test construct validity of the dimensions, confirmatory factor analysis (CFA) had to be conducted. According to the CFA two-indicator rule for models with more than one dimension, two indicators for each dimension are considered as sufficient minimum requirement. However, this research followed the recommendation of Kline (2015) and associated three indicators for each dimension, in order to avoid technical problems during the analysis. The indicators for each dimension have been derived based on identified human related challenges reported in the literature for ANX, MOT and TRU as illustrated in chapter 3. The indicators for COM are based on the Self-Perceived Communication

Competence Scale (SPCC) (McCroskey, 1988). The SPCC measures respondent's perception of their communication competence. It consists of 12 items, which are basically four different situations: talking to someone in public, in a meeting, in a group or in a dyad. For each of these situations, the person to be addressed differs in terms of familiarity that is it can either be a stranger, an acquaintance or just a friend. However, in order to minimize the amount of question items for this research, only three items were selected for communication competence. The items focused on situations where the respondent is demanded to talk to a stranger in different situations. This is in particular important as fluctuation is relatively high and developers are demanded to join new projects in very short time periods. They are thus constantly facing issues to adapt to new project environments and new co-workers.

3.4.4. PRE-TEST

The first step was to ensure that the wording of the survey was easy to understand and that the participants were able to access the website and the online survey. The website was thus sent to the panel of experts, which were illustrated in section 3.4.2. No issues have been reported in regard to accessibility of the website and the survey. The feedback in regard to the survey was good. The completion of the survey took around 8 minutes and the questions were easy to understand. Though, two HRACI survey items were criticized to be not comprehensive by the panel of experts and therefore have been rephrased based on the received feedback.

3.4.5. PILOT STUDY PHASE

After the Pre-test, the pilot study phase has been conducted. The purpose of a pilot study is to ensure that the survey questions operate well, but also that all applied instruments as a whole functioned well (Bryman, 2015). In particular, as the HRACI was a new designed assessment tool, internal validity had to be ensured before starting the main data collection.

In the pilot study phase, multiple validation rounds had been executed. For each validation round, invitations had been sent via the business network LinkedIn to complete both the HRACI and the WLEIS. After a couple of surveys had been completed, the data was analyzed. For the HRACI, survey questions with low Cronbach-alphas have been altered before starting the next validation round. For the first seven validation rounds Cronbach-alphas had not reached the threshold of 0.7. The number of collected surveys and the Cronbach-alphas for each HRACI dimension are illustrated in Table 8. As internal consistency has stabilized in the eighth data collection round, no HRACI items had been altered anymore and the datasets of the eighth data collection round had been used as main data set for data analysis. Data analysis of the main data set is illustrated in chapter 4.

Table 8 HRACI internal consistency for pilot study

Scale	Dimension	Cronbach-alpha #1 (n=19)	Cronbach-alpha #2 (n=49)	Cronbach-alpha #3 (n=13)	Cronbach-alpha #4 (n=18)	Cronbach-alpha #5 (n=57)	Cronbach-alpha #6 (n=36)	Cronbach-alpha #7 (n=13)
HRACI	Anxiety	0.703	0.545	0.461	0.633	0.773	0.725	0.924
HRACI	Motivation	0.592	0.912	0.824	0.833	0.844	0.906	0.763
HRACI	Communication	-0.113	0.753	0.469	0.845	0.583	0.637	0.684
HRACI	Mutual Trust	0.208	0.405	0.577	0.845	0.620	0.705	0.493

n = 205

3.5. Quantitative Method

As mentioned in the above chapter, this research applied quantitative research methods, i.e. survey research in order to collect data. The key elements of survey research are illustrated below.

3.5.1. POPULATION

A population is a collection of all concerned units that the researcher would like to study within a particular problem space (D O'Gorman, 2014). The units do not necessarily have to be human beings, but can also be nations, cities or companies (Bryman, 2015). A population can also be referred to as the full set of cases from which a sample is taken (Saunders et al., 2012). This research is investigating IS-professionals in general as well as IS-professionals working in agile teams. Therefore, the population for sample 1 is defined as any professionals working and according to Dayaratna (2019), there were 23 million software developers worldwide in 2018. In regard to sample 2, which only includes professionals working in agile teams, the number should be slightly below, as the majority of organizations (97%) practice agile development methods (VersionOne, 2018).

3.5.2. SAMPLING PROCESS

For many research questions it is impracticable to collect data from the entire population and therefore the research has to select a sample of this population (Saunders et al., 2012). The sample obtained should be as representable of the population under investigation as possible (D O'Gorman, 2014) and ideally, the sample should be a microcosm of the population (Bryman, 2015).

3.5.3. Sampling Frame

A sampling frame is a listing of all units in the population from which the units have been selected (Bryman, 2015). For this research the creation of a sampling frame is practical, as the definition of the population as any IS-professional working in agile teams is very generous.

3.5.4. Sampling Technique

There exists two broad types of sampling techniques: probability and non-probability (D O'Gorman, 2014). As illustrated by Bryman (2015), a probability sample has been selected using random selection, so that each unit in the population has a known chance of being selected. In contrast to this, a non-probability sample has not been selected using random selection methods and thus implies that some units have a higher chance to be selected than other units. As stated by Bryman (2015), in general it is assumed that probability sampling is more likely to produce a representative sample. In addition, when using non-probability sampling it is not possible to address research questions that require to make statistical inferences about the characteristics of a population (Saunders et al., 2012).

This study uses a non-probability sample. The invitations to participate in the survey were sent via the researcher's personal business network via LinkedIn. Hence, individuals in known by the researcher had a higher change of being selected. The implications in regard to limitations of this study and generalization of the findings are discussed in chapter 5.

3.5.5. SAMPLE SIZE

Generalizations about populations using probability sampling are based on statistical probability and therefore according to the law of large numbers, the larger the sample's size the lower the likely error in generalizing the population (Saunders et al., 2012). Though, as stated by Bryman (2015), it is the absolute sample size rather than the relative sample size that is important. As a minimum, a sample size of at least 30 units has been suggested (Saunders et al., 2012). In fact, different authors recommend different sample sizes as appropriate for quantitative research, including a range between 200 and 300 units (D O'Gorman, 2014). This research followed this recommendation as will be illustrated below.

3.5.6. DATA COLLECTION INSTRUMENT

Different data collection methods exist and some are more structured and some are less structured. As outlined by Bryman (2015), some data collection methods emphasize an open-end view of the research process and therefore are less restricted on the topics and issues being studied. These less structured data collection methods include participant observation or semi-structured interviews. Other methods such as surveys or structured interviews are considered to be structured data collection methods, as they require to establish in advanced the broad contours of what the researcher is trying to examine. Surveys can be an effective way of describing a phenomenon and therefore have been widely used for descriptive, as well as explanatory research (Greenfield and Greener, 2016). When used in explanatory research, they in particularly suit to suggest possible reasons for particular relationships between variables and to produce models of these relationships (Saunders et al., 2012). Though, in contrast to experimental studies, survey research relies on the existing variation in the collected sample rather than creating it with

intervention, such as creating control groups, random allocation to groups or experimental interventions (Greenfield and Greener, 2016).

Surveys research, i.e. learning about agile practices by asking practitioners about their experience, is common in the context of agile software development (Ochodek and Kopczyńska, 2018). For example, it has been used to study critical success factors by Chow and Cao (2008), to understand the perceived importance of agile requirements engineering practices by Ochodek and Kopczyńska (2018) or to understand the impact of tailoring criteria on agile practices adoption by Campanelli et al. (2018). Taken also into account that it also allows the collection of standardized data from a sizeable population in a highly economical way (Saunders et al., 2012), survey research has been selected as most suitable research strategy for this research.

Survey research can be conducted using research instruments, such as structured interviews or self-completion questionnaires. Structured interviews use questionnaires based on predetermined and standardized set of questions when interviewing participants. This is in contrast to in-depth non-standardized interviews, which operate with open questions and therefore are also often referred to as qualitative research interviews (Saunders et al., 2012). With a self-completion questionnaire, participants answer standardized questions by completing the questionnaire themselves (Bryman, 2015). Hence the selection of the appropriate research instrument depends on whether the questionnaire should be administered face to face or rely on self-completion (Bryman, 2015). As stated by Saunders et al. (2012), questionnaires are seldom used in exploratory research that requires a large number of open-end questions and therefore tend to be used in descriptive and explanatory research (Saunders et al., 2012).

On the other hand, self-completion questionnaires enable to test proposed hypotheses using predetermined scales. Furthermore, compared to structured interviews, self-completion questionnaires tend to be easier to answer, as they have less open questions, tend to have an easy-to-follow design to prevent that the respondent will omit a question and tend to be shorter, in order to reduce risk of respondent fatigue (Bryman, 2015). As a result, they are more economic, easier to administer and also more convenient for the respondent. As a result, this research will use self-completion questionnaires as quantitative research instrument.

3.5.7. COLLECTION OF TWO SAMPLES

In total 454 response were collected. During data screening five responses that were identical to other responses and strongly appeared to be caused by technical problems were excluded. Two participants did not give consent to use their data and were also excluded. As a result, in total 447 valid datasets could be collected. WLEIS survey items were not altered at all during the whole data collection period. Though, HRACI survey items were altered multiple times during the pilot study phase, until internal validity for all of its dimensions reached the academic acceptable threshold of Cronbach's alpha > 0.7. For the final Sample 2, the HRACI has not been altered anymore and hence only Sample 2 has been used for testing the proposed hypotheses. The two valid samples that could be extracted are:

- Sample 1, which was collected between 09th June and 26rd October 2018, containing WLEIS records of 447 IS-professionals to examine the psychometric attributes of their EI.

- Sample 2, which was collected between 13th July and 26rd October 2018, containing HRACI and WLEIS records of 194 agile practitioners to examine human related challenges perceived by agile practitioners and a potential causal inference with their degree of EI.

3.6. Indicating Causal Inference in Observational Studies

3.6.1. THREE CLASSIC CRITERIA TO INDICATE CAUSALITY

One fundamental objective in social scientific research is to investigate causation (Hu, 2016) and to indicate a causal relationship among study variables the three classic criteria: time order, correlation and nonspuriousness have to be established (Abbott and McKinney, 2013, Antonakis et al., 2010).

In order to establish the time order criteria, the degree of EI has to be developed before the perceived challenges are perceived by the agile team members. Furthermore, correlations between the study variables EI and HRACI have to be investigated, e.g. by computing Pearson correlations between them. Though, as nicely stated by Box-Steffensmeier (2007), one of the most repeated mantras in social science is that "correlation does not imply causation". To imply that changes of one variable causes changes in another variable, this research needs also to ensure that their relationship is not spurious, i.e. that there are no unaccounted causes making the original variables just to appear to be correlated (Abbott and McKinney, 2013). This could be caused by omitted confounding covariates or even a loop of causality between the studied variables. The last criteria of nonspuriousness, which is also referred to as endogeneity (Antonakis et al., 2010), is in fact the most challenging part. The failsafe to ensure nonspuriousness is to

use randomized experiments, because if the individuals were randomly assigned to the treatments, the baseline characteristics, also referred to as covariates, on average are approximately equal (Antonakis et al., 2010). In that case, the control group and the treatment group are then certainly only randomly different, as well as equal from another in regard to all covariates, both observed and unobserved (Stuart, 2010). However, randomisation is often unethical or just not feasible (Russo et al., 2011). In social science, most studies are therefore designed based on non-experimental design and observational data, as the studied objects can often not be randomly exposed to the event (Tsapeli and Musolesi, 2015) or the variables of interest cannot be manipulated because of their attributes (Belli, 2009). In fact, observational studies are often the only viable option in many psychological research studies that intend to address causal-and-effect questions (Harder et al., 2010). Common methods used in non-experimental design to examine causal inference are adjusting for background variables in a regression model, structural equation modelling, selection models or matching methods (Stuart, 2010).

3.6.2. Regression models and Structural Equation Modelling

One common method to indicate causal inference in observational studies is to use regression based techniques or by analysis of covariance (ANCOVA) (Forrest, 2012, Lanza, 2013). The basic idea is to regress the dependent variable using the independent variable, as well as all other confounding covariates (Abbott and McKinney, 2013) in order to account for differences in measured covariates (Austin, 2011). Yet, as highlighted by Gelman and Hill (2006), causal effect can only be estimated using multivariate regression, if the applied regression model is accurate, i.e. that all sources of variation of the dependent variable are known and observable (Antonakis et al., 2010). The model also have to satisfy the assumptions that the linearity or non-linearity of the observed variables

is correct (Tsapeli and Musolesi, 2015). Consequently, from a practical point of view this method is difficult to apply, as it is very sensitive in regard to the applied regression model (Antonakis et al., 2010). Furthermore, selection models and regressions models have been shown to perform poorly when there is insufficient overlap between the treatment and control group (Stuart, 2010). Due to these limitations, Harder et al. (2010) called for a need for parsimony of applying multivariable regression models. Although, regression analysis and ANCOVA can also remove the confounding bias, they still strongly rely on functional form assumptions and extrapolation (Kim and Kim, 2017). Hence, researchers have hence been searching for more effective means of dealing with large numbers of covariates (Harder et al., 2010).

Another common approach is structural equation modelling (SEM). SEM models causal relations between study variables, by including all variables that are known to have some involvement in the process of interest (Field, 2000). Hence, a SEM consists of the relationship between the latent variables of interests and measurement models representing the relationship between the latent variables and their observational indicators (Kroehne et al., 2003). However, SEM cannot fully control for all potential background variables (Forrest, 2012). Hence, although SEM can represent causal relationships, a well-fitting SEM does not necessarily contain any information about causal dependencies at all and therefore testing the fit of SEM is not a test of causality (Kroehne et al., 2003). Moreover, the estimates provided by SEM are no different from those obtained from regression or a simple correlation (Field, 2000).

Causal relationships must be established by design rather than relying upon statistical models, whose assumptions are almost never defended (Box-Steffensmeier, 2007),

because statistical findings are associational only and plausible assumptions are needed to give findings causal meanings (Rose, 2019). As a result, without an experiment or some other strong design, no amount of statistical modelling can make the move from correlation to causation persuasive (Box-Steffensmeier, 2007). An alternative approach that is popular among researchers who wish to infer causal effects in observational studies is Propensity Score Matching (Fong, 2018) and it should be applied, when researchers lack control over treatment selection, but have good knowledge about the selection mechanism (Kim and Kim, 2017).

3.6.3. Propensity Score Matching

Propensity Score Matching (PSM) is a mathematical approach that utilizes the participant's probability to be assigned to a group to balance the participants between the groups (Forrest, 2012). This probability is calculated based on a propensity score, which is the probability of being treated, by summarizing the covariates into one single scalar (Stuart, 2010). In fact, the propensity score exists in both, randomized experiments and in observational studies. In randomized experiments it is known and defined by the study design. In observational studies it is in general not know, however can be estimated using the study data (Austin, 2011). PSM enables researchers to design and analyze an observational study by mimicking some of the particular characteristics of a RCT (Austin, 2011). The idea behind PSM is to compare treated individuals to similar control units, i.e. to create a counterfactual as described in Rubin's Causal Model (Antonakis et al., 2010).

3.6.3.1. Inferring Causality using Propensity Score Matching

Rubin's Causal Model (RCM) (Rubin, 1974) is based on a hypothetical scenario in which, momentarily ignoring the limitations of the physical world, a person's outcome under two

treatment conditions each taken at the same time is compared (Rose, 2019). It establishes a causal effect through a comparison of an observed pattern with its counterfactual which is constructed by manipulating one or several explanatory quantities to be valuated at their counterfactual state (Hu, 2016). Therefore, it is also often referred to as counterfactual framework (Rose, 2019).

The major epistemological issue with RCM concerns the soundness of the counterfactual approach (Russo et al., 2011). It's fundamental problem is how to estimate the missing outcome (Shadish, 2010), because only one of the potential outcomes, treated or not treated can be observed and thus, the counter-fact itself can actually never be observed (Russo et al., 2011). This problem is referred to as fundamental problem of causal inference (Rose, 2019). Consequently, the validity of any conclusions, which are derived from the counter-fact, cannot be empirically assessed (Dawid, 2000) and hence resulting in a lack of sound empirical basis (Russo et al., 2011). Yet, the strengths of this framework is its simplicity, as the researcher can focus only on whether the cause is associated with a difference in the outcome between the participants, but not all mechanisms behind the outcome (Rose, 2019). As a result, the RCM has been increasingly applied in many fields, such as education (Perez, 2015), ecology (Ramsey et al., 2018) or family violence (Rose, 2019).

The RCM includes the three key elements: units, treatment and potential outcomes (Shadish, 2010). In regard to this research, the units are IS-professionals working in agile teams. In psychological research, treatment can be more broadly defined as in intervention research and can refer to any predictor or exposure in the observational context about which the research wants to estimate the causal effect (Harder et al., 2010,

Lanza, 2013). For this research, the exposure would be any measurement that increases the degree of EI, e.g. EI training. Furthermore, the potential outcomes would be the degree of perceived human related challenges in agile teams.

In order to reduce bias and to obtain a good estimation of the unobserved potential outcomes, it is desirable to compare units in treated and control groups that are as similar as possible in regard to the covariate distribution (Stuart, 2010). Therefore, exact matching is considered to be the ideal method (Imai et al., 2008). Here, units with the exact same covariate values, but different treatment values are compared and the bias of the covariates is thus eliminated. However, exact matching is often not feasible, e.g. when too many covariates exists or if some covariates are continuous (Box-Steffensmeier, 2007). Alternatively, the treatment units have to be matched with the most similar control units (Tsapeli and Musolesi, 2015). This can be obtained by matching methods, such as stratification, inverse probability or covariate adjustment (Austin, 2011). These multivariate matching methods work well when the number of covariates is small and subjects in the control group is large relative to the number of treatment subjects (Kim and Kim, 2017). However, when dealing with more than just a few covariates, it becomes very difficult to find matches, with close or exact values of all covariates and an importance advance was made with the introduction of the propensity score (Stuart, 2010). Yet, the assumption is that propensity scores are free from hidden bias and that relevant covariates have been included in the model (Forrest, 2012).

3.6.3.2. CONFOUNDING COVARIATES TO INCLUDE

In quasi-experimental designs, the group selection can be influenced by any number of covariates leading to bias in the estimation of the treatment effect (Forrest, 2012). Hence,

non-experimental studies rely on the assumption of strong ignorability that is that there are no unobserved differences between the treatment and the control group. In order to satisfy this assumption, it has to be ensured that all covariates that might influence the treatment assignment or the outcome are included in the matching process (Stuart, 2010). The most challenging issue with PSM is therefore the selection of covariates for establishing strong ignorability (Kim and Kim, 2017). The aim is to balance the distribution of these covariates in the treated and control group and thus reduce bias that might be caused by these covariates (Stuart, 2010). PSM can thus only provide consistent estimates, if the researcher has sufficient knowledge about covariates that predict whether an individual would have received the treatment or not (Antonakis et al., 2010). In fact, not all covariates, related to treatment and outcome needs to be included, as a sufficient number of covariates is sufficient to delink selection into treatment from the outcome (Herzog, 2014). Covariates omitted are controlled for the extent that they correlate with the covariates included in the propensity score. From a theoretic perspective, the inclusion of only those covariates that effect the treatment assignment is sufficient and thus covariates related to the outcome can be neglected (Austin, 2011).

Yet, the decision to include certain variables as covariates or not should be generous, because there is no huge impact when including variables that actually do not influence the treatment variable. However, neglecting potentially important covariates could be very costly in regard to increased bias (Stuart, 2010). Therefore, researchers should seek to identify covariates grounded in the literature that are likely to influence the treatment selection (Forrest, 2012).

3.6.3.3. CONTINUOUS TREATMENT VARIABLE

The treatment variable for this study is EI, which is a continuous variable. Yet, despite of its popularity, the application of PSM has been primarily confined to a binary treatment, i.e. that there are only two groups: treated and control group (Imai and David, 2004, Fong, 2018). Although, methods such as the Generalized Propensity Score (Hirano and Imbens, 2004) have been introduced to deal with continuous treatment variables, as highlighted by Stuart (2010), diagnostics are complicated and less intuitive for these methods, as it becomes more complex to assess the balance of the co-variates, when there are multiple treatment groups (Stuart, 2010, Fong, 2018). They thus suggest, that more future work is required to examine these issues. As a consequence, the application of PSM to a continuous treatment is rare due to a lack of available methods (Fong, 2018). Consequently, researchers often dichotomize the continuous treatment variable in order to apply PSM, e.g. Nielsen et al. (2011), De and Ratha (2012). For this study, EI has thus been dichotomized, in a way that participants, with a score in the upper third of the population in the examined EI dimension have been assigned to the treatment group and respectively, participants with score in the lower third have been assigned to the control group.

3.7. Research Ethics

Since this research collected primary data that involved human participants, their tissue or their data, ethics approval by the University of Bradford was required. In the submitted ethics approval from, the researcher stated the research aims and objectives, along with details in regard to the research instruments and the target population. Ethics approval has been granted on the 24.04.2018 (see appendix 4).

3.8. Chapter Summary

This chapter provided an overview about the applied quantitative research method and its underlying philosophical considerations. It justified the use of survey research as suitable quantitative research methodology. It then illustrated the elements of the applied questionnaire, including its structure and validation process. This was followed by presenting Propensity Score Matching as data analyzing method for this research. The chapter concludes with information about the research ethics approval that was obtained prior to data collection. The next chapter presents the data analysis using the instruments that have been illustrated in this chapter.

4. CHAPTER 4: DATA ANALYSIS AND DISCUSSION

4.1. Introduction

The previous chapter presented the research methodology, including the philosophical considerations, the research design, the data collection instruments and the data analyzing methods. This research used a web survey and collected data from international IS-professionals. As a result, two samples have been collected. The first sample included WLEIS records of 447 IS-professionals and will be used in study 1 to examine the psychometric properties of their EI. The results of study 1 are a prerequisite for study 2, which examines the causal effect of EI on perceived human related challenges based on the second sample. The second sample included both, HRACI and WLEIS records of 194 agile practitioners. In order to examine both samples, IBM SPSS v.24 and IBM AMOS v.25 was used.

This chapter also includes the discussion of the findings of the data analysis for each sample. The EI of the IS-professionals is also compared to other samples that have been assessed with the exact same version of WLEIS. Finally, the proposed hypotheses are tested and the revised conceptual model is presented and discussed. For the confirmed hypotheses the impact of EI on the perceived challenges is computed and discussed.

This chapter is structured as follows. In section 4.2, the psychometric properties of the EI of IS-professionals is examined based on the first sample. In section 4.3, the proposed hypotheses in regard to the perceived human related challenges are tested and discussed based on the second sample. The chapter then ends with an overview of the overall chapter in section 4.4.

4.2. Study 1: Emotional Intelligence of IS-professionals

Research indicates that certain personal attributes might influence EI and scholars have expended significant effort to examine associations of a subject's characteristics, academic and life experiences and his EI (Margavio et al., 2014). This chapter investigates the characteristics of IS-professionals in regard to their EI. The results of study 1 will then be used in study 2 in order to identify the confounding covariates required to estimate the causal effect of their EI on their perceived human related challenges.

4.2.1. Properties of Sample 1

Sample 1 contains 447 WLEIS records. The participants represented 75 different cultural backgrounds, with the majority either being Indians (26%) or Germans (21%). The cultural distribution is illustrated in Table 9. 18 % of the participants were female and 82% were male. Almost two-thirds of participants (63%) were between 25 and 40 years old. Within the sample 81% were performing a technical role such as developer. The other participants were occupying functional or management roles, such as scrum master, product owners, functional consultants or software testers.

Table 9 Cultural distribution of sample 1

Cultural Background	Count	Cultural Background	Count	Cultural Background	Count	Cultural Background	Count
Albanian	8	Cuban	1	Jordanian	2	Russian-German	2
American	2	Dutch	1	Latvian	1	Scottish-Irish American Decent	1
Arabic	3	Eastern European	2	Lebanese	2	Serbian	5
Arabic/Muslim	1	Egyptian	8	Macedonian	2	Singaporean	1
Argentinian	3	English, french, german	1	Malaysian	3	SK-EU/working in DE	1
Armenian	1	European	2	Mexican	1	Slavic	1
Asian	2	Finnish	1	Middle Asian	1	Slavic / Ukrainian	1
Australian	1	French/Moroccan	1	Middle Eastern	3	Slovenian	1
Balkan	1	Generic global culture	1	Nepalese	2	South America	1
Bangladeshi	3	German	92	O	1	Spanish	7
Bosnian	6	German and French	1	Other European	1	Sri Lankan	2
Brazilian	15	Greek	4	Pakistanian	5	Swiss - Mexican	1
British	4	Hungarian	1	Persian and white American	1	Syria	1
British (Scottish)	1	Indian	115	Polish	11	Tunisian	1
Bulgarian	2	Indonesian	4	Portuguese	2	Turkish	9
Chilean	1	Iranian	5	Puerto Rico	1	Ukrainian	13
Chinese	9	Irish	1	Romanian	13	Uzbek	1
Colombian	1	Israeli	2	Russian	17	Venezuelan	1
Croatian	12	Italian	7	Russian (Caucasian)	1		

This sample size is similar to sample sizes used by scholars in similar research using WLEIS to assess EI, such as Ng et al. (2007) to perform a CFA of the WLEIS on 628 international college students, Li et al. (2012) to measure equivalence of WLEIS between three groups of Chinese university students consisting of 680, 151 and 151 or Iliceto and Fino (2017) with 476 responses to validate the Italian version of the WLEIS.

4.2.2. Item and Scale Analysis

All dimensions of the WLEIS were normal distributed as shown in Figure 8.

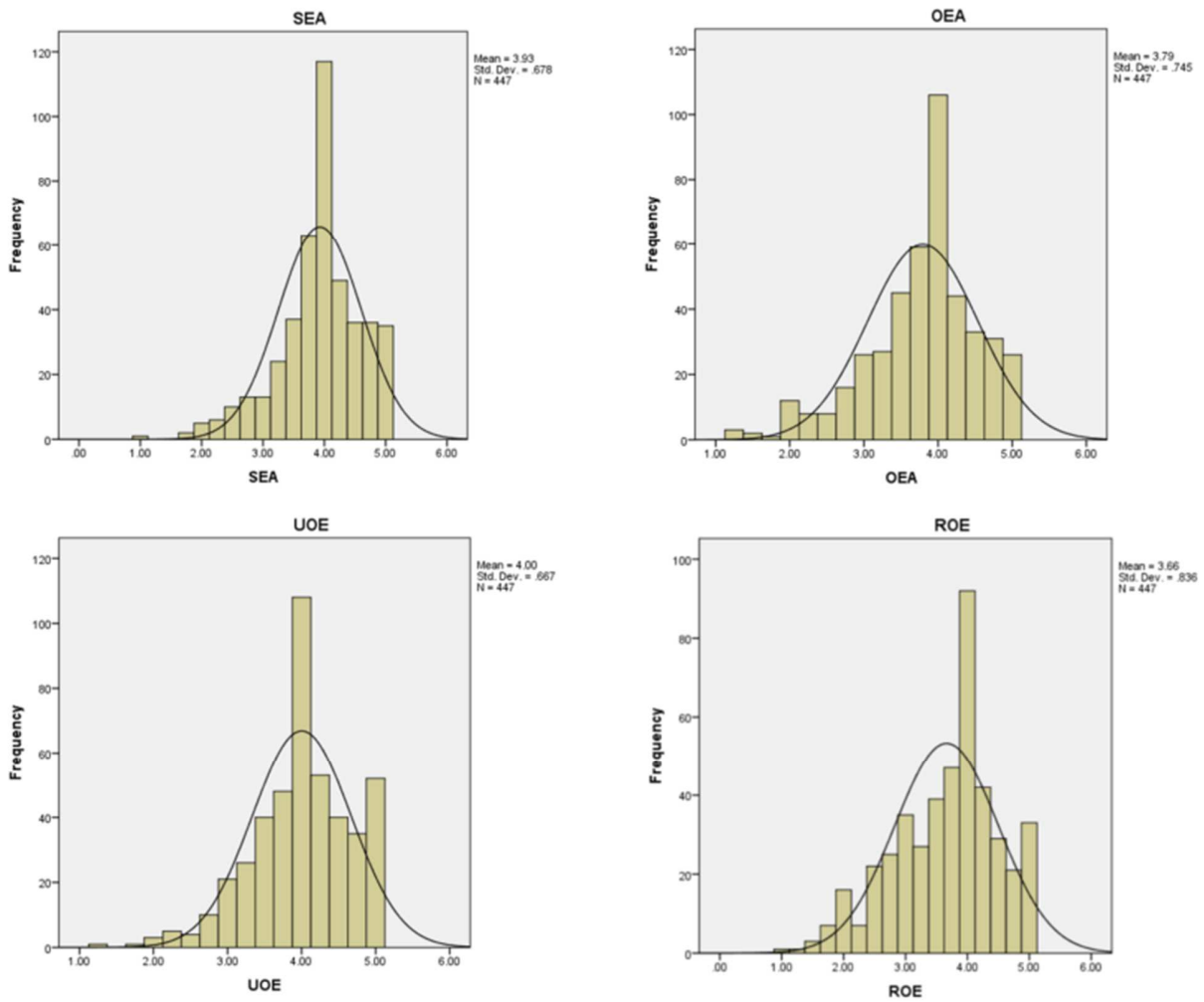

Figure 8 Normal distribution

The correlations among the four WLEIS dimensions are shown in Table 10. All correlations were significant with $p \leq 0.01$. They were low to moderate and in the expected positive directions.

Table 10 Pearson correlations among WLEIS dimensions

Pearson Correlations among WLEIS dimensions

Dimension	SEA	OEA	UOE	ROE
SEA	1	0.39**	0.30**	0.41**
OEA	0.36**	1	0.22**	0.17**
UOE	0.30**	0.22**	1	0.27**
ROE	0.41**	0.17**	0.27**	1

n = 447; **p ≤ 0.01 (two-tailed test)

In order to examine structure validity, a confirmatory factory analysis (CFA) using maximum likelihood method was conducted. Fig 9 presents the CFA model for the WLEIS and its standardized parameter estimates. All factor loadings met the recommended cut-off criteria 0.32 (Tabachnick and Fidell, 2007). All values also met the cutoff criteria for acceptable model fit recommended by Schreiber et al. (2006). The $\chi 2$ / df ratios (chi-square and degree of freedom) were less than 2 or 3 and the RMSEA (root mean square error or approximation) values less than 0.60, indicating an acceptable model. For CFI (comparative fit index) and TLI (Tucker Lewis index), the values were all greater than 0.95, indicating a good fit. The Goodness-of-fit statistics are presented in Table 11.

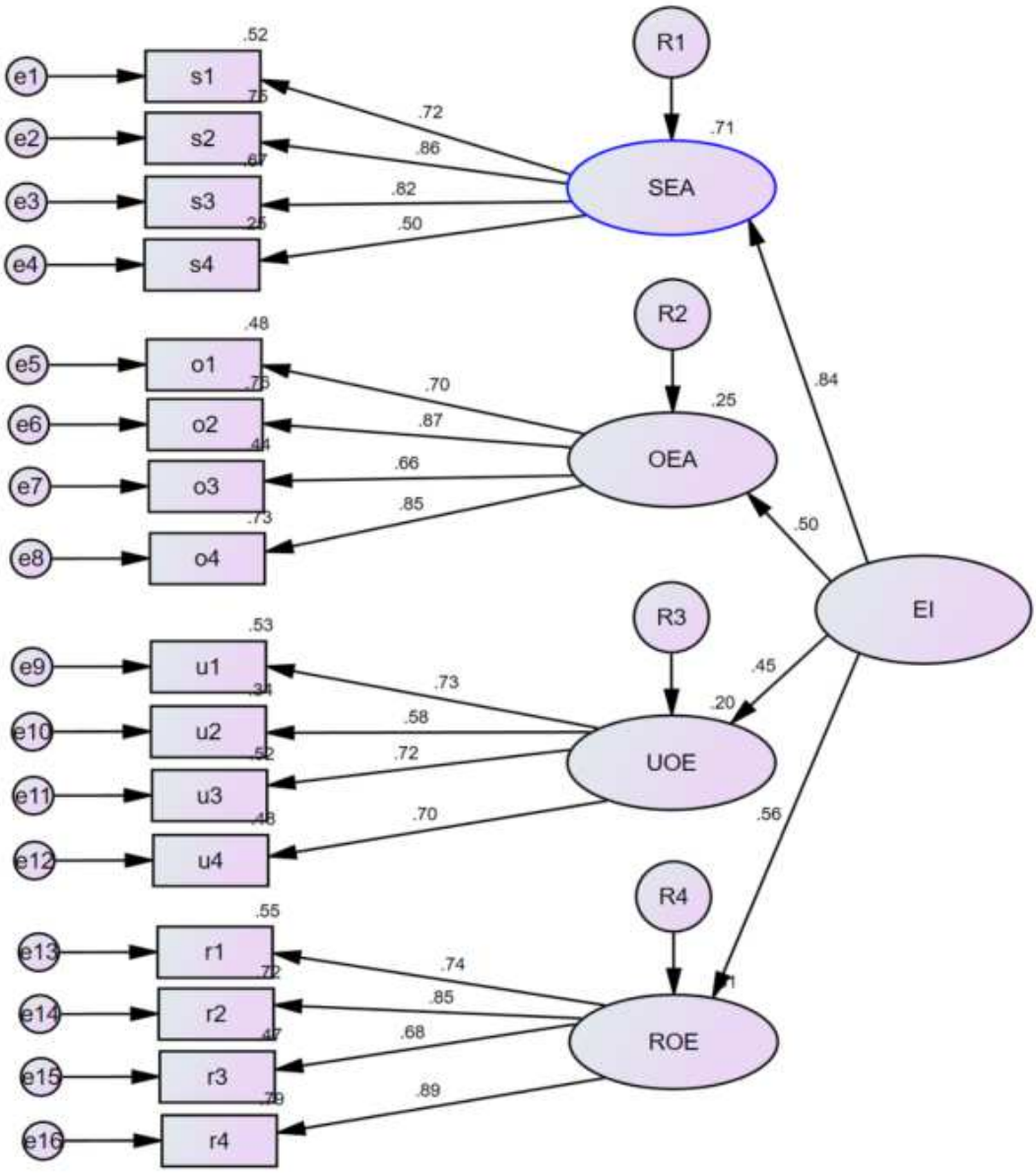

Figure 9 WLEIS CFA model and standardized parameter estimates

Table 11 Goodness-of-fit statistics WLEIS

Scale	Models	$\chi2_{(df)}$	$\chi2$ / df	RMSEA	CFI	TLI
WLEIS	First-order	$195.443_{(98)}$	1.994	0.047	0.969	0.962
WLEIS	Second-order	$205.540_{(100)}$	2.055	0.049	0.966	0.959

4.2.3. DO WOMEN HAVE HIGHER EI THAN MEN?

To examine the effect of gender, an independent-sample t-test based on the 81 female and 366 male participants of the sample was performed. The results showed that only OEA was significant different with $p \leq 0.05$. Though, the difference was only marginal higher for female than men. For all other dimensions of EI, the difference was also marginal but not statistical significant. The descriptive statistics and independent sample t-test results are presented in Table 12.

Table 12 Gender: descriptive statistics and independent sample test

Dimension/ Population	female n = 81		male n = 366		t-test for equality of means	
	M	SD	M	SD	M Difference	SE Difference
SEA	3.96	0.67	3.92	0.68	0.04	0.83
OEA	3.94	0.67	3.76	0.76	0.18*	0.09
UOE	3.95	0.61	4.01	0.68	-0.07	0.82
ROE	3.51	0.93	3.70	0.81	-0.18	0.10

*M = Mean, SD = Standard deviation, SE = Standard Error, *p ≤ 0.05 (two-tailed test)*

Weilemann and Brune (2015) claimed that women particularly suit to the role as agile scrum masters in software development, because the female management style promotes team spirit and a constructive and communicative working atmosphere. They argued that female can be more successful scrum masters than men, because they are able to perceive the needs of their team members, they include the whole team in the decision process and share knowledge. Their argumentation certainly arouses curiosity, if these

skills might be caused by women possessing higher EI than men. A study conducted by Carvalho et al. (2016) supported this. Using WLEIS to examine the EI of 954 Spanish and Portuguese medical student, they reported differences in the dimensions OEA and UOE. In specific, female perceived and understood the emotions of others better than male. Whereas male perceive stronger ability to make use of their emotions and direct them towards their personal goals. In the same vein, Cabello et al. (2016) claimed that the available evidence reported by scholars indeed suggests that women have a higher EI than men. Though, they also concluded that although significant differences in EI in regard to gender were reported, the magnitude of the effect size ranged only from small to medium. In contrast to these results, Shi and Wang (2007) reported significant higher EI for male compared to female students, when examining Chinese students. Using the WLEIS to examine Chinese participants aged 13-40 years, Kong (2017) also reported that females have lower scores than males on SEA, UOE and ROE. On the other hand, other scholars could not find any differences in EI when comparing female with men. For example, studies conducted by Abe et al. (2013) among Asian medical students or Perez-Gonzalez et al. (2010) among UK students could not find any significant differences in EI between genders. Also no gender differences when using WLEIS have been reported by Libbrecht et al. (2014), when comparing Belgium to Singaporean participants or Iliceto and Fino (2017), when examining Italian adults.

The findings of this research indicate that EI of women and men in IS is similar, with women scored slightly higher in OEA than men. This is in line with previous research that recognized that women were slightly superior to men in perceiving emotions (Mayer et al., 1999). Similarly, Kret and De Gelder (2012) stated that women are better in recognizing facial expressions of emotions in other people, i.e. fear and sadness. They argued that

this is an adaption to presumed social structures, where women had to take care of preverbal offspring and recognize their emotional cues. Another explanation was proposed by LaFrance and Hecht (1999), who argued that women must recognize emotions more carefully, because they possess less power in society than men.

4.2.4. DOES EI VARY FOR DIFFERENT AGE CATEGORIES?

Participants classified themselves into in four age categories: young adults (18-25), adulthood (25-40), middle age (40-60) and older age (> 60). Only one participant was older than 60 years. This group has thus been excluded from this particular analysis. Table 13 presents the descriptive statistics in regard to the remaining three age categories. The means differences between all age categories were only marginal. ANOVA analysis indicated that differences were also not statistical significant.

Table 13 Age: descriptive statistics

Dimension/ Population	young adults n = 104		adulthood n = 281		middle age n = 61	
	M	SD	M	SD	M	SD
SEA	3.83	0.73	3.97	0.67	3.89	0.62
OEA	3.87	0.74	3.79	0.72	3.68	0.84
UOE	4.09	0.65	4.01	0.68	3.83	0.60
ROE	3.69	0.84	3.65	0.85	3.66	0.79

M = Mean, SD = Standard deviation

The findings are in line with other recent research that also found that EI is stable for adults. For example, Carvalho et al. (2016), when assessing the EI of first to sixth year undergraduate medical students with a mean age of 21.2 years or Iliceto and Fino (2017), who reported no differences for 476 Italian participants with a mean age of 30.

Yet, there is also preliminary evidence that EI actually changes even for adults. For example, Yuan et al. (2012) found that employees increase their level of EI as a way of interpreting and making sense of their work content, which consequently improved their work performance. In a similar vein, findings reported by Cabello et al. (2016) suggest that EI is increasing for young adults, peaking in the middle adulthood and then decreasing for older adults. They argued that this is due to increasing cognitive ability and accumulated life experience with a peak in middle adulthood and followed by a decline of cognitive functions. In addition to this, there is also accumulating evidence that EI can be increased by special training as discussed in section 4.2.6.

4.2.5. DOES CULTURE MATTER?

The mean EI of the two largest groups in the final sample, which were 115 Indians and 92 Germans, were compared to a similar study conducted by Gunkel et al. (2014). In their attempt to investigate culture's influence on EI, they examined the EI of business students from nine different countries, among others also Indians and Germans. To assess EI, they applied the exact same version of the WLEIS with a five-point Likert scale. The remaining groups of participants from sample 1 with other cultural backgrounds were excluded from this particular analysis, because they were too small. The descriptive statistics and independent sample tests are illustrated in Table 14.

Table 14 Culture: descriptive statistics and independent sample test

Dimension/ sample	international IS-professionals author sample 1 (2019)						international business students Gunke et al. (2014)			
	Indian		German		t-test for equality of means		Indian		German	
	M	SD	M	SD	M Difference	SE Difference	M	SD	M	SD
SEA	4.13	0.59	3.89	0.68	0.25**	0.09	3.73	0.81	3.53	0.74
OEA	4.04	0.63	3.65	0.76	0.40**	0.10	3.91	0.79	3.76	0.62
UOE	4.25	0.65	3.96	0.68	0.29**	0.09	3.87	0.72	3.82	0.68
ROE	3.78	0.86	3.72	0.81	0.06	0.11	3.51	0.88	3.48	0.85

*M = Mean, SD = Standard deviation, SE = Standard Error, **p ≤ 0.01 (two-tailed test)*

For international IS-professionals, the means for SEA, OEA and UOE were statistically higher with **p ≤ 0.01 for Indians compared to Germans. Comparing both samples, it is notable that for both samples the Indians had higher values in all EI dimensions, with ROE having the lowest difference but high differences for the remaining three dimensions, SEA, OEA and UOE. Drawing on Hofstede's (2001) cultural dimensions, Gunkel et al. (2014) reported that the dimension, collectivism, uncertainty avoidance and long-term orientation had the highest impact on EI and according to their results, Indians scored higher in these dimensions than Germans.

This result is also in line with other studies, who indicated that the cultural context might affect people's understanding of emotions (Lee and Kwak, 2012). In fact, it is recognized that emotions, although biological based, are socially and culturally shaped and maintained and that culture thus influences societal norms and standards associated to emotional expressions and recognitions (Li et al., 2012). For example, Ng et al. (2007) used the WLEIS to examine the EI of 691 international college students residing in the US. The participants represented 92 countries from Africa, Asia, Europe, Latin America, North America and Oceania. Their findings indicated that Indian students report significant higher levels of ROE than Chinese and Korean students and also higher levels of OEA and SEA compared to Korean students. In summary, the Korean students had the lowest levels on all four EI dimensions. In a related study, Lee and Kwak (2012) developed a trait EI scale for Korean adults. They realized that Korean adults do not differentiate the two dimensions emotional recognition and emotional understanding. They argued that this is due to them perceiving both dimensions as inseparable factors, as knowledge on emotions is considered to be essential to accurately recognize emotions and vice versa. Also other studies reported differences in EI in regard to culture. For example, Margavio

et al. (2012) compared Chinese and American student's EI and reported that the mean EI of American students was significant higher compared to Chinese students. In another study, Abe et al. (2013) reported that Japanese medical students EI was especially lower compared to other Asian or British medical students. Similarly, Van Rooy et al. (2005) examined the EI scores across Whites, Blacks and Hispanics and reported that Hispanics scored significantly higher than Whites. They argued that Hispanics are raised using emotions as a tool for situational interpretation and processing. Therefore, they have been shown to perceive environmental stimuli using emotional filters such as love, intimacy and nurturance.

These studies support Roberts et al. (2001), who claimed that cultural differences have not been incorporated enough into the conception of EI. As a result, researchers should consider controlling for country-of-origin when analyzing EI data (Ng et al., 2007) and also specify the cultural settings in which the EI test can be administered (Lee and Kwak, 2012).

4.2.6. CAN EI BE INCREASED BY TRAINING?

Within sample 1, 26 participants had received special EI training. The descriptive statistics, comparing them with the remaining 421 participants and correlations are illustrated in Table 15. The mean differences for the dimensions OEA and UOE were significant higher than for participants, who have not received any EI training before, with $^{**}p \leq 0.01$. Correlation analysis showed that EI training is also significant related to OEA and UOE, with $^{**}p \leq 0.01$.

Though, comparing means and correlations can only give hints about the effect of EI training on EI, as both are biased to given covariates. According to the results illustrated above, OEA is significant correlated to gender and cultural background and UOE is correlated to cultural background only. Age was not correlated to any EI dimensions significantly. Accordingly, in order to estimate the ATE, propensity score matching was conducted with EI training as treatment variable, subclassification with five subclasses and the covariates gender and cultural background for OEA and cultural background for UOE. The resulting ATEs were 0.49 for OEA and 0.36 for UOE and similar compared to the mean differences and are illustrated in Table 15.

Table 15 EI training: descriptive statistics, independent sample test and Pearson correlations

Dimension/ Population	yes n = 26		no n = 421		Correlation n = 447	t-test for equality of means n = 447		ATE n = 447
	M	SD	M	SD		M Difference	SE Difference	
SEA	4.12	0.78	3.92	0.67	0.69	0.20	0.14	-
OEA	4.20	0.51	3.77	0.75	0.14**	0.43**	0.15	0.49
UOE	4.37	0.50	3.98	0.67	0.14**	0.39**	0.13	0.36
ROE	3.79	0.80	3.66	0.84	0.04	0.13	0.17	-

*M = Mean, SD = Standard deviation, SE = Standard Error, **p ≤ 0.01 (two-tailed test)*

The results of this study are in line with prior research. In a study conducted by Nelis et al. (2009), significant increase in emotions identification and emotions management abilities have been found when training young psychology students in EI. In a subsequent study, Nelis et al. (2011) reported a significant increase in overall EI, and in particular the abilities to understand and regulate emotions, when conducting an 18 hours EI-training on Belgium students. These improvements resulted in long-term significant increases in extraversion and agreeableness as well as a decrease in neuroticism. Their results also showed that the development of EI results in positive changes in psychological well-being, subjective health, quality of social relationship, and employability. Hence, they argued that

the effect size of EI training is sufficiently large to be considered as meaningful in people's lives. Schutte et al. (2013) conducted a literature review, including organizational, educational, mental health and sports studies to examine whether EI can be increased by training and whether this can lead to increase of other beneficial outcome. They concluded that there is preliminary evidence that EI training can be effective in increasing the competencies comprising EI. Furthermore, they stated that EI training may also have the potential to improve functioning in realms such as work, academic functioning, life satisfaction, mental and physical health and personal relationship. In the same vein, Lopes (2016) stated that a few rigorous, experimental studies of emotional skills training programs for adults have indicated that EI competencies indeed can be trained and that this has yielded positive effects on well-being, social relationships and employability. Mattingly and Kraiger (2019) recently conducted a literature review to investigate whether EI can be trained. Their results showed a moderate positive effect for EI training regardless of the type of EI measure, ability or mixed EI.

With the purported relationship between EI and work performance, the interest among human resource practitioners was stimulated and consulting firms, organizations and even universities started to offer special training and assessment of EI (Joseph and Newman, 2010b, Mattingly and Kraiger, 2019). Compared to more long-term or costly talent management approaches, such as selection processes, EI training programs can provide a more immediate benefit to organizations such as improved performance and affective outcomes for employees and managers (Mattingly and Kraiger, 2019).

4.2.7. IS THE EI OF IS-PROFESSIONALS DISTINCT FROM OTHER GROUPS?

The data of sample 1 was then compared to three other related studies, which are described below. These three studies were selected, because they all used the exact same original version of WLEIS (Wong and Law, 2002), were all in English language and were also assessed with a 5-point Likert scale.

Study one was conducted by Joseph and Newman (2010a). One purpose of this study was to investigate discriminant validity of WLEIS by assessing self- and peer reports. Hence, the population consisted of international undergraduate students of a large American university and their friends. The population size was 560 respondents in total that is 280 undergraduates and 280 friends. The undergraduates had an average age of 19.1 and 55.4 % were female. The majority of respondents were Caucasian (69.6 %), followed by Hispanics (15.9%), African Americans (6.2%), Asians (5.1%) and others (3.3%). Their friends had similar characteristics, with an average age of 19.4 and 56.9% were female. Also their culture background was similar with Caucasians (72.4%), Hispanics (10%), African Americans (6.8%), Asians (5.2%) and others (5.6%).

In the second study, Li et al. (2012) examined the measurement invariance of WLEIS across three Chinese university groups from Canada and China. Among these three groups, two were assessed in Chinese and were thus not considered for this research. Though, one group used the English version of WLEIS. The participants of this group all originated from China, though were studying in a Canadian University. This group consisted of 72 male and 79 female participants with a mean age of 20.37 years.

The third study, conducted by Libbrecht et al. (2014), measured the invariance of WLEIS for Singaporean and Belgium graduate students. The Belgium students completed a

Dutch version of WLEIS and were thus not considered for this research. The Singaporean students were assessed in English. The Singaporean sample size was 505, including only ethnic Chinese students. 48.5% were male and respectively 51.5% were female. The mean age was 22.0 years. Table 16 shows the descriptive and reliability statistics for all four groups.

Table 16 Descriptive and reliability statistics for WLEIS dimensions

Dimension /Sample	international IS-professionals author sample 1 (2019)			international students and friends Joseph and Newman (2010)			Chinese students Li et al. (2012)			Singaporian-Chinese students Libbrecht et al. (2014)		
	M	SD	Cronbach α	M	SD	Cronbach α	M	SD	Cronbach α	M	SD	Cronbach α
SEA	3.93	0.68	0.81	4.12	0.65	0.80	3.80	0.61	0.78	3.91	0.65	0.81
OEA	3.79	0.74	0.85	3.90	0.66	0.81	3.55	0.70	0.81	3.77	0.71	0.88
UOE	4.00	0.67	0.77	4.04	0.75	0.83	3.64	0.73	0.78	3.79	0.68	0.82
ROE	3.66	0.84	0.87	3.77	0.87	0.88	3.51	0.82	0.86	3.54	0.78	0.87

M = Mean, SD = Standard deviation

The mean values of the sample of international IS-professionals were similar to the sample consisting of international students and their friends. However, the mean values for Chinese and Singaporean-Chinese students had lower values. The standard deviations for all dimensions were similar for all groups. Though, notable is that the ranking of the dimensions was also similar across the groups. SEA and UOE had the highest values, followed by OEA and ROE which had the lowest values. Also internal consistency reliability, calculated by Cronbach alpha coefficients were adequate for all WLEIS dimensions across all groups.

Despite of being characterized as introvert and a low need for social interaction as illustrated above, the EI of IS-professionals was not lower compared to other social groups. This finding is in line with previous studies (Petrides and Furnham, 2001, Bar-On, 2006, Joseph and Newman, 2010b) that provided evidence that EI is distinct from personality traits, i.e. extraversion.

4.3. Study 2: Impact of EI on Human related challenges in Agile teams

The previous section investigated how the individual characteristics of IS-professionals influence their EI. These results are now used in order to estimate the causal effect of EI on perceived human related challenges using sample 2.

4.3.1. Properties of Sample 2

Data collection started July 13th 2018 and was conducted for eleven weeks. Approximately 4.000 personal invitations were sent through LinkedIn, which is one of the leading business network online platforms. In total 324 participants completed the survey. Two participants did not give consent to use their data. From the remaining population, 210 participants mainly worked in agile managed projects. The rest of participants, who work with traditional or hybrid project methodologies, were not considered for this research. In order to reduce bias, outliners were also excluded from the dataset. An outliner is a participant with a score very different from the rest of the data (Field, 2013). For this research an outliner was defined as a participant possessing either a high EI, but perceiving many challenges within his agile team or possessing low EI, but perceiving only few challenges. Accordingly, seven participants with a WLEIS and HRACI score in the upper fifth percentile and two participants with WLEIS and HRACI scores in the lower fifth percentile were also excluded from the final sample. Furthermore, seven participants had received EI training before. As this is only a small fraction of the population and as recent research indicated that these kind of trainings indeed can increase EI for adults (Lopes, 2016), these participants were also excluded, in order to reduce bias when estimating the treatment effect. As a result, the final sample 2 contained 194 participants. The sample size of this research is comparable to sample sizes used by scholars for similar purposes, such as a sample size of 111 to examine correlations between EI and communication levels in IT-professionals (Hendon et al., 2017), a sample size of 202 to explore the relationship among EI, perceived transformational leadership

and work performance (Chen et al., 2015) or a sample size of 102 to investigate the effects of emotional intelligence on job performance and life satisfaction (Law et al., 2008). Most participants were male (86%), between 25 and 40 years old (77%) and occupied a technical role within the agile team (84%), such as developer or technical consultant. The participants came from 53 different cultural backgrounds which are illustrated in Table 17. Though, the majority either came from a German (22%) or Indian (23%) cultural background. Despite of the high percentage of German participants, this is a fair representative sample of the global software industry, as it is dominated by men (Weilemann and Brune, 2015) and the Indian IT service industry is possessing a high share of the world market (Woszczynski et al., 2016).

Table 17 Cultural distribution sample 2

Cultural Background	Count	Cultural Background	Count	Cultural Background	Count	Cultural Background	Count
Albanian	3	Croatian	4	Latvian	1	Russian-German	1
American	1	Cuban	1	Lebanese	1	Scottish-Irish American Decent	1
Arab	2	Dutch	1	Macedonian	1	Serbian	3
Argentinian	1	Egyptian	4	Malay	1	SK-EU/working in DE	1
Armenian	1	English, french, german	1	Mexican	1	Slavic	1
Asian	1	French/Moroccan	1	Middle Eastern	1	Slavic / Ukrainian	1
Australian	1	German	42	Nepali	1	Spanish	4
Bangladeshi	1	Greek	2	Other European	1	Sri Lankan	2
Bosnian	4	Indian	44	Pakistani	2	Turkish	3
Brazilian	9	Indonesian	1	Poland	1	Ukrainian	7
British	3	Iranian	1	Polish	3	Uzbek	1
Bulgarian	1	Israeli	1	Portuguese	1		
Chilean	1	Italian	4	Romanian	7		
Colombian	1	Jordanian	1	Russian	9		

4.3.2. Item and Scale Analysis

As shown in Figure 10, none of the HRACI dimensions were normal distributed. The statistical methods selected did take this into consideration, by applying Spearman's rho rather than Pearson for correlation analysis.

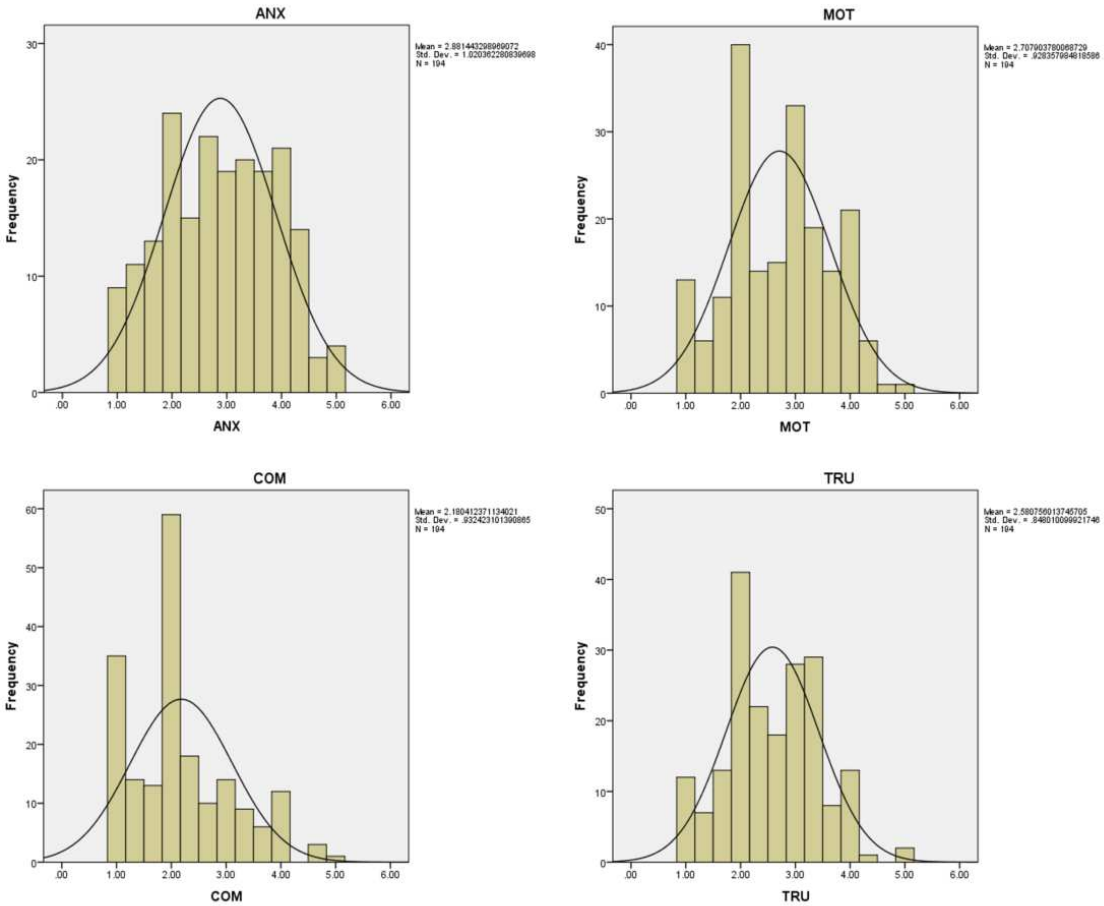

Figure 10 Normal distribution of HRACI dimensions

Table 18 reports reliability statistics for all dimensions of HRACI and WLEIS. Cronbach-alphas were all above 0.7, indicating that the survey items were good indicators of the construct they were supposed to measure.

Table 18 Reliability statistics

Scale	Dimension	Mean	S.D.	Cronbach-alpha
HRACI	Anxiety	2.881	1.236	0.776
HRACI	Motivation	2.708	1.07	0.836
HRACI	Communication	2.18	1.042	0.875
HRACI	Mutual Trust	2.581	1.059	0.720
WLEIS	Appraisal and expression of emotion in oneself	3.919	0.864	0.818
WLEIS	Appraisal and recognition of emotion in others	3.773	0.894	0.848
WLEIS	Use of emotion to facilitate performance	3.995	0.871	0.749
WLEIS	Regulation of emotion in oneself	3.657	0.973	0.857

n = 194; S.D. = standard deviation

Confirmatory factor analysis using maximum likelihood method was conducted to examine structure validity for both scales. According to Sun (2005), a χ2 / df ratio (chi-square) and degree of freedom) less than 2 or 3 and a RMSEA (root mean square error or approximation) less than 0.08 indicate an acceptable model. For CFI (comparative fit index) and TLI (Tucker Lewis index) a value greater than 0.9 indicates an acceptable fit and a value greater than 0.95 indicates a good fit. The results, which are presented in Table 19, demonstrate good fit for both scales. Furthermore, all factor loadings met the recommended cut-off criteria 0.32 (Tabachnick and Fidell, 2007).

Table 19 Goodness-of-fit statistics

Scale	Models	$\chi2_{(df)}$	χ2 / df	RMSEA	CFI	TLI
HRACI	First-order	$59.982_{(48)}$	1.250	0.036	0.986	0.981
HRACI	Second-order	$63.944_{(50)}$	1.279	0.038	0.984	0.979
WLEIS	First-order	$166.021_{(98)}$	1.694	0.060	0.949	0.938
WLEIS	Second-order	$169.397_{(100)}$	1.694	0.060	0.948	0.938

The CFA model for HRACI and its standardized parameter estimates are shown in Fig 11.

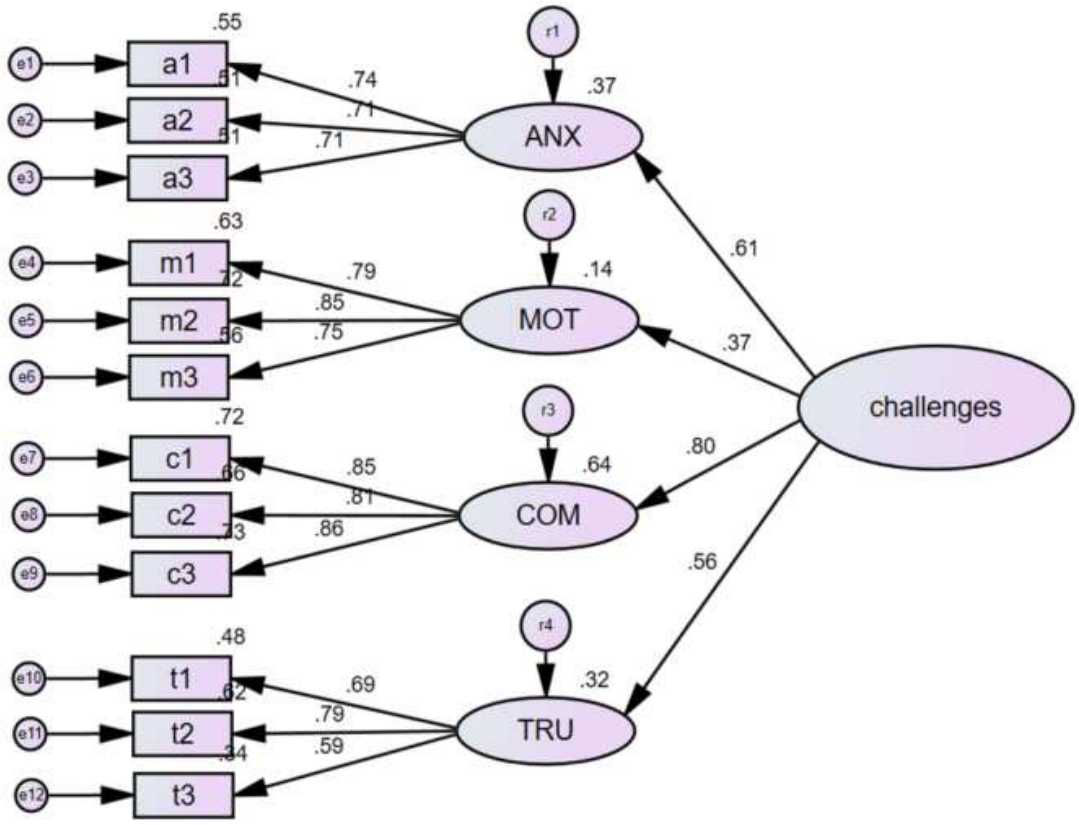

Figure 11 HRACI CFA model and standardized parameter estimates

Fig 12 presents the CFA model for the WLEIS and its standardized parameter estimates.

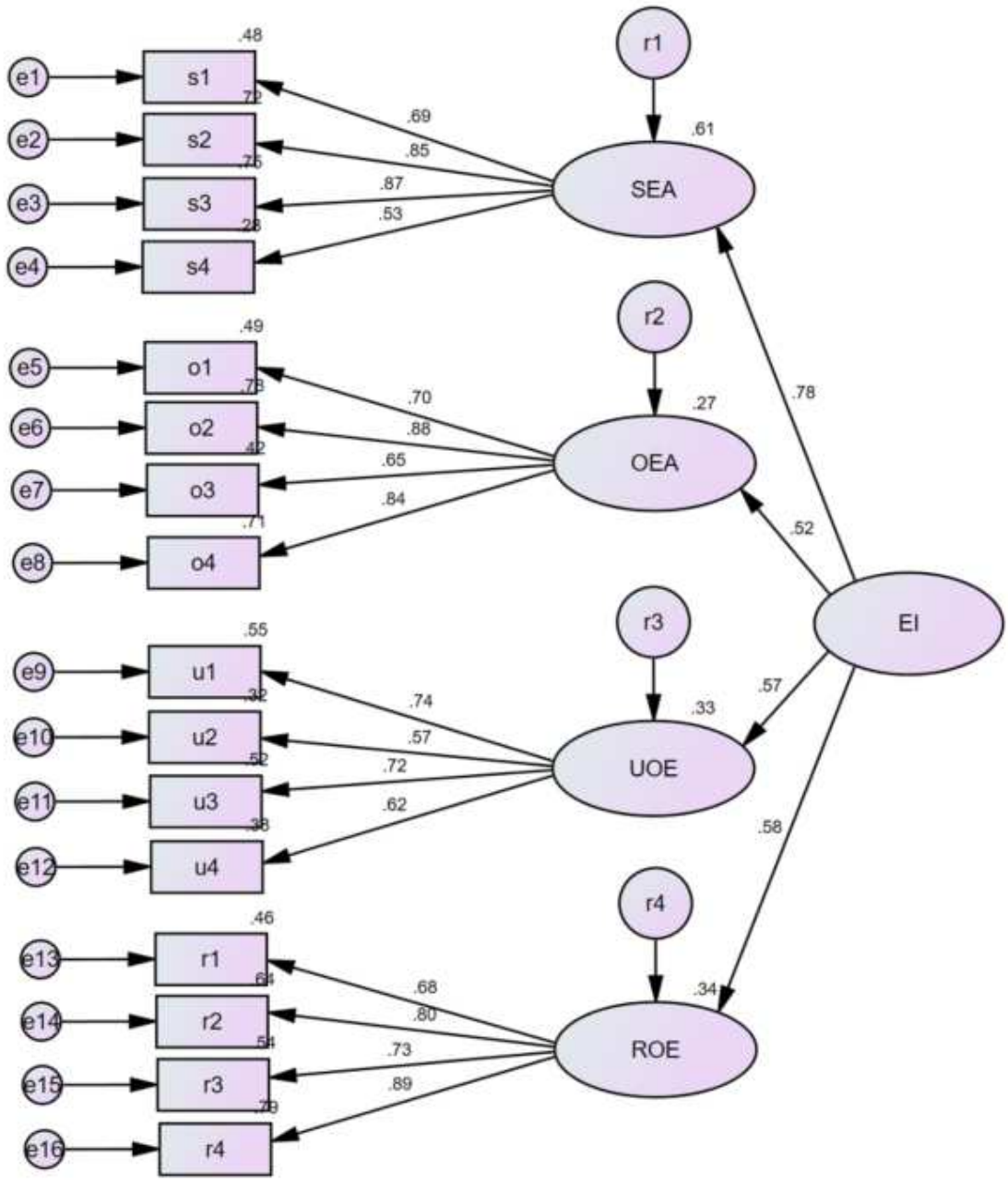

Figure 12 WLEIS CFA model and standardized parameter estimates

Correlations as illustrated above are a prerequisite to indicate causal inference. As the HRACI dimensions did not meet the assumption of normality, Spearman-rho was applied to calculate correlations, which are shown in Table 20.

Table 20 Correlation matrix

Dimension	Anxiety	Motivation	Communication	Mutual Trust
Appraisal and expression of emotion in oneself	-0.155*	-0.074	-0.268***	-0.104
Appraisal and recognition of emotion in others	-0.023	-0.034	-0.154*	-0.195**
Use of emotion to facilitate performance	-0.177*	-0.195**	-0.248***	-0.095
Regulation of emotion in oneself	-0.116	-0.202**	-0.274***	-0.226**

***$p \leq 0.001$; **$p \leq 0.01$; *$p \leq 0.05$; n = 194 (two-tailed test)

The data analysis resulted in ten significant correlations. For these correlations the Average Treatment Effects were calculated and are discussed in the next section.

4.3.3. IMPACT OF EI ON PERCEIVED CHALLENGES

In order to quantify the impact of EI on the perceived challenges the Average Treatment Effects (ATE) were calculated by applying PSM. The ATE is the difference between the average outcomes in the conditions to which different participants have been assigned to (Rose, 2019). It can hence also be referred to as the average treatment effect, at the population level, by moving an entire population from untreated to treated (Austin, 2011).

ATEs were calculated only for combinations which were significant correlated. The covariates were selected based on the results of study 1 that is culture for SEA, gender, training and culture for OEA and training and culture for UOE. For ROE no covariates were considered. The ATEs were calculated by applying subclassification, with five subclasses defined by quantiles of the propensity score. This has the advantage that the initial bias due to covariates can be reduced to at least 90% (Stuart, 2010). After performing the calculations, subclasses representing the lowest fifth quantile either had

no and only one participant in the treatment group. Similarly, in the subclasses of the highest fifth quantile, either no or only one participant was in the control group. In order to reduce bias, the subclasses of the lowest and highest fifth quantile were thus excluded for calculation of ATEs. The ATEs are illustrated in Table 21.

Table 21 Average treatment effect

Dimension	Anxiety	Motivation	Communication	Mutual Trust
Appraisal and expression of emotion in oneself	-0.13		-0.29	
Appraisal and recognition of emotion in others			-0.17	-0.31
Use of emotion to facilitate performance	-0.62	-0.45	-0.34	
Regulation of emotion in oneself		-0.29	-0.32	-0.25

The ATE values are all negative and range from low (0.13) to moderate (0.62). They thus indicated that participants with higher levels of EI perceived less human related challenges. For example, an IS-professional with high ability to use his emotions to facilitate performance perceived 0.45 less motivation challenges based on a 5-point Likert scale compared to an IS-professional with only a low degree in the same ability. Notable is that the ability to use emotions to facilitate performance had the highest ATEs among all dimensions of EI.

4.3.4. Hypothesis Validation and Revised Conceptual Model

The analysis of the data has confirmed seven and rejected two of the proposed hypothesis. Also three new findings were identified.

Hypothesis 1a, proposing a negative association between ROE and ANX was not supported ($p = 0.106$). Hypothesis 2a and 2b, suggesting a negative association between MOT and UOE, as well as ROE were both fully supported with statistical significance ($p \leq$

0.01). Hypothesis 3a and 3c, suggesting a negative association between COM and SEA as well as ROE were also both fully supported with statistical significance ($p \leq 0.001$). Hypothesis 3b proposing a negative association between COM and OEA was also supported with statistical significance ($p \leq 0.05$). Hypothesis 4a and 4c, suggesting a negative association between TRU and ROE, as well as OEA were both fully supported with statistical significance ($p \leq 0.01$). Finally hypothesis 4b, proposing a negative association between TRU and SEA was not supported ($p = 0.150$). The results also revealed three associations that were not hypothesized. SEA and UOE were both significant negatively associated with ANX ($p \leq 0.05$). Finally, COM and UOE were also statistically significant negatively associated ($p \leq 0.001$). The revised conceptual model is presented in Figure 13.

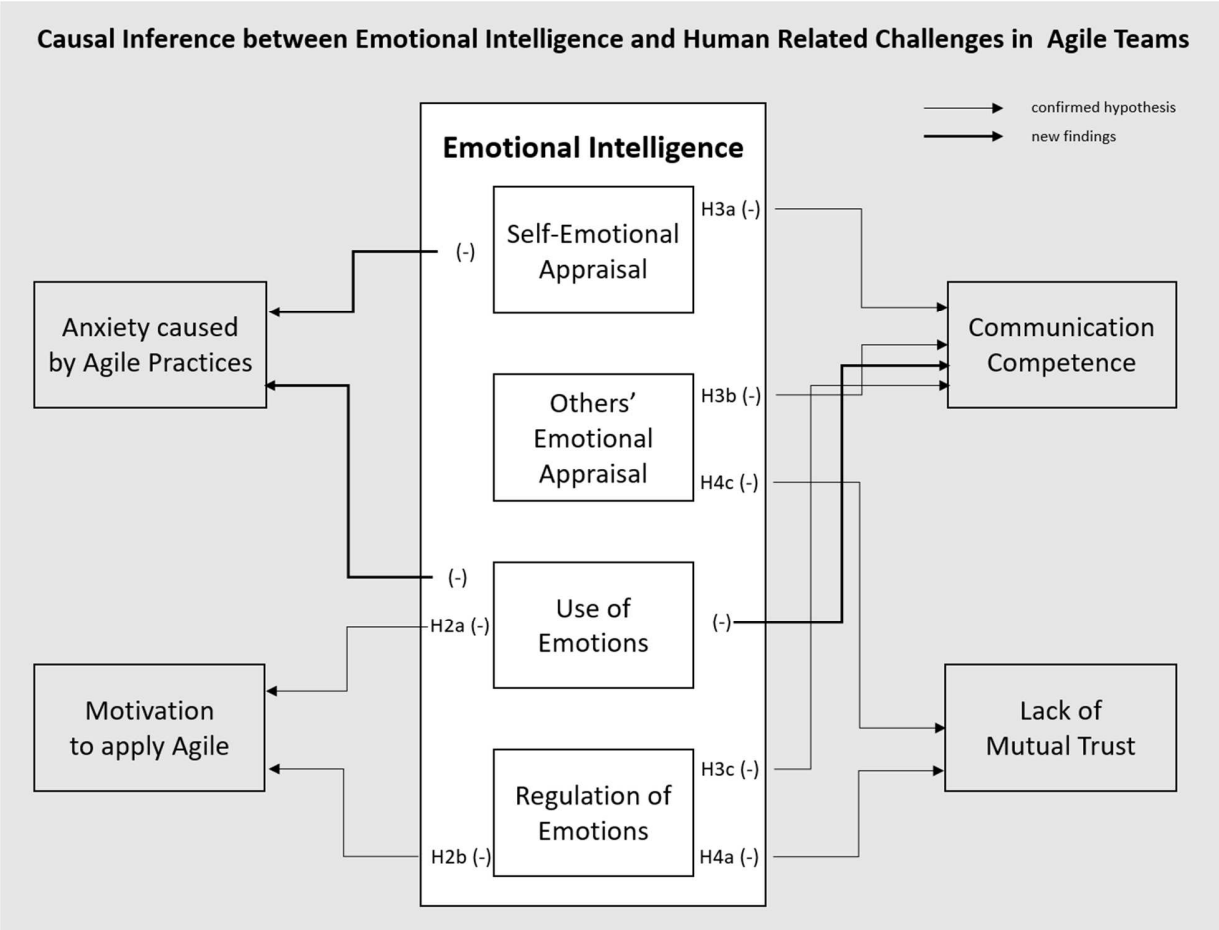

Figure 13 Revised Conceptual Model "Impact of Emotional Intelligence in Agile teams" (author)

The purpose of this research is to examine if a lack of EI has a negative effect on perceived human related challenges in agile teams in the dimensions: anxiety, motivation, communication competence and mutual trust. As hypothesized, the results revealed ten significant negative associations between different dimensions of EI and the measured perceived challenges. All measured dimensions of EI had a negative effect on two or three measured dimensions of the perceived challenges. Therefore, the results also indicate that different dimensions of EI play a different role in affecting different dimensions of the measured challenges. This was most apparent for perceived communication challenges,

which were affected by all dimensions of EI. However, although the presented correlation were statistical significant, the calculated ATEs were low to moderate. The abilities to use emotions to facilitate performance and to regulate emotions in oneself had the strongest predictive power among all dimensions of EI. As a result, this research provides preliminary evidence that the degree of agile team members EI plays an important role in the successful adaption of agile practices. The confirmed hypothesis and the new findings are now discussed in the following sections.

4.3.5. EI AS PROTECTIVE FACTOR FOR ANXIETY

The results indicate that anxiety in agile teams is negatively affected by the abilities of self-emotional appraisal and use of emotions. This understanding can assist in preventing anxiety of agile team members, which is crucial for their success. For example, if agile team members lack the ability to regulate their emotions and feel insecure, they might be reluctant to be transparent about their weaknesses and feel afraid to admit the truth about what is really happening in their teams (Dorairaj et al., 2012). Moreover, agile team members need an environment where they feel safe to expose their weaknesses (Conboy et al., 2011). In a similar vein, Thorgren and Caiman (2019) argued that agile team members need a sense of psychological safety, that is they must feel safe to speak up when noting a gap in others' work or difficulties in their own (Thorgren and Caiman, 2019). Hence, the decision on the extent of agile use should consider concerns raised by agile team members where significant anxiety is noted, management may wish to make participation in agile teams optional if possible (Cram, 2019).

Furthermore, these findings are also consistent with results of prior research. For example, male medical Iranian students perceive less test anxiety, if they have high EI

(Ahmadpanah M. et al., 2016) or young Spanish football players who have low scores in perceiving and regulating their emotions report higher levels of anxiety (Castro-Sánchez et al., 2019). Recent research has also indicated that EI can diminish the probability of anxiety (Abdollahi and Abu Talib, 2015) and therefore can serve as a protective factor in the path from rumination to anxiety (Liu and Ren, 2018).

However, this research did not find a relation between the ability to regulate emotions and perceived anxiety as hypothesized. Despite of empirical research that reported that the ability to regulate emotions is negatively related to anxiety (Law et al., 2008, Shih et al., 2014, Thomas et al., 2017, Martínez-Monteagudo et al., 2019), significance level for this hypotheis with $p = 0.105$ was not significant.

4.3.6. EI AS PREDICTOR FOR MOTIVATION

The results of this study have found that the abilities to use emotions and to regulate emotions both had a negative effect on agile team members to perceive challenges in regard to motivation. As motivation is crucial for the success of agile teams, Javdani Gandomani and Ziaei Nafchi (2016) suggested that agile team members, who experience motivation challenges, need more time to change themselves and to find their ways to adopt agile practices.

The results are also in line with prior research, such as Law et al. (2008), who stated that EI is a reasonable predictor of motivation, because individuals with high EI are able to regulate and user their emotions to improve performance and therefore they are able to focus their efforts and maintain their motivation levels. In a similar vein, Christie et al. (2007) found that individuals with higher ability to regulate emotions are more likely to

report being motivated by achievement needs. Recently, there has also been growing interest in examining the relation of EI and motivation in the context of athletes. For example, Rubaltelli et al. (2018) conducted a study to investigate the impact of EI on half marathon finish times. Their results suggested that individuals who are effective at controlling emotions can reduce the impact of fatigue, which then leads to better performance. They argued that this is in particular important when participating in foot races, as it takes great mental strength to keep going despite feeling close to exhaustion. In another recent study related to athletes, Sukys et al. (2019) examined adult basketball players and reported that the ability to manage emotions is negatively related to athletes' motivation to perform.

4.3.7. ALL DIMENSONS OF EI ARE RELATED TO COMMUNICATION COMPETENCE

The security and ease of communication is fundamental in agile projects, in order to keep individual team members in sync with the iterative cycle as well as with other team members (Thorgren and Caiman, 2019). Both, individual EI as well as team EI enhance a team's ability to communicate, to be open for different opinions and to utilize emotions to improve team decision making (Barczak et al., 2010). It has to be ensured that team members feel safe to offer constructive criticism, can be honest about their own progress and are willing to share information (Thorgren and Caiman, 2019). EI is not about changing who you are to become someone else, but it is about understanding and adapting so that you can effectively communicate and lead your team (Nguyen et al., 2019).

The results have revealed that all four dimensions of EI, self-emotional appraisal, others' emotional appraisal, use of emotions and regulation of emotions have a negative effect

on communication challenges occurring in agile teams. The results of this research are in line with what has been previously reported. For example, a significant relationship between EI and social communication competence has been found when examining American IS-professionals (Hendon et al., 2017), Malaysian students with high EI have been reported to better command in communication skills (Ahmad Marzuki et al., 2015) or the ability to manage others' emotions is significantly correlated with communication performance (Troth et al., 2012b).

4.3.8. EI FOSTERS MUTUAL TRUST

The results indicate that mutual trust challenges in agile teams are negatively affected by the ability to appraise others' emotions and the ability to regulate one's own emotions. The results confirmed prior finding, such as Barczak et al. (2010) who examined American students and found that team emotional intelligence promotes team trust and trust in turn fosters a collaborative culture which then enhances the creativity of the team. In a similar study, Rezvani et al. (2016) examined Australian project managers and found that EI has a positive effect on trust, but also on job satisfaction and overall project success. In another recent related study, Rezvani and Khosravi (2019), examined the impact of EI on stress and trust among sofware developers. They found that EI mitigates stress and therfore fosters trust among software developers.

4.4. Chapter Summary

Chapter 4 presented the data analysis, findings and discussions of the two samples. In regard to IS-professionals, the findings indicate that EI of women is similar to men and that EI is also stable for adults. However, the data also provided evidence that culture

differences in EI exist and also that EI can be increased by special EI training. It has also been concluded that the EI of IS-professionals is not distinct from other groups. Finally, the results also confirmed the majority of the proposed hypotheses. Therefore, it can be concluded that a lack of EI is a root cause for human related challenges perceived by agile team members. The following chapter will present the conclusions, contributions and limitations of this research.

5. CHAPTER 5: LIMITATIONS, CONCLUSION, CONTRIBUTION AND FUTURE DIRECTIONS

5.1. Introduction

The previous chapter presented the data analyses, the findings and the discussion for two samples. As a result a conceptual model has been presented that illustrates causal inference between EI and human related challenges in Agile Teams. This is now followed by illustrating the limitaions, conclusion, contribution and future research opportunities.

This chapter is structured as follows. In section 5.2, the limitations are discussed. This is followed by illustrating the conclusions in section 5.3. In sections 5.4 and 5.5 the contributions to theory and practice are presented. The chapter closes with providing future research directions.

5.2. Limitations

This research has some limitations that need to be taken into account. First, both HRACI, as well as WLEIS are self-report measures and therefore prone to self-enhancement and socially desirable responses (Lopes, 2016). Hence, scholars have raised concerns, if EI

assessed by self- report measures, actually measures an actual ability rather than a trait (Mayer et al., 2008b, Brannick et al., 2009, Joseph and Newman, 2010b). Contrariwise, self-report EI measures are more efficient to assess EI in cross-cultural settings, because they tap into typical attributes of the individual's thoughts, feelings, and behaviors in certain situations (Li et al., 2012). Subjective assessments may even provide a more comprehensive view of (perceived) emotional abilities, because test-takers are more likely to draw upon their full range of emotional experience across different context in life (Lopes, 2016). Second, the continuous treatment variable EI has been dichotomized. Although, methods such as the Generalized Propensity Score (Hirano and Imbens, 2004) exists, diagnostics are complicated for these methods, as it becomes more complex to assess the balance of the covariates (Stuart, 2010). Consequently, the application of PSM to continuous treatment is rare (Fong, 2018) and researchers often dichotomize the continuous treatment variable in order to apply PSM (e.g. (Nielsen et al., 2011, De and Ratha, 2012)).

5.3. Conclusion

With the increasing popularity of agile in modern software development, agile practitioners realized that its adoption within an organization is challenging (Gregory et al., 2016). Yet, prior work has only focused on reporting various human related challenges, without providing insights about their origins (e.g. Conboy et al. (2011), Lalsing et al. (2012), Javdani Gandomani and Ziaei Nafchi (2016)).

The first objective of this study was to examine the EI of IS-professionals in regard to their individual characteristics. The findings in regard to gender, age and culture are similar to previous studies. In additions, this study provides evidence for the reliability and validity of the WLEIS in a sample of IS-professionals. The results also demonstrate that despite of being characterized to be introvert and having a low need for social interaction, their EI is not distinct from the EI of other groups.

The second objective of this research was to examine if human related challenges perceived by agile team members might be caused by a lack of their EI. The results showed significant negative association and low to moderate ATEs between all dimensions of EI and the dimensions of the reported challenges: anxiety, motivation, communictation competence and mutual trust. Hence, the findings of this study provide preliminary evidence that these challenges are negatively related to specific dimensions of EI.

5.4. Contribution to Theory

This study has applied PSM in a non-experimental study based on a sample of IS-professionals working in agile teams. It has provided preliminary evidence that a lack in different dimensions of EI can cause different kinds of human related challenges in agile teams. Hence, it has made four notable contributions to theory.

First, this study extends the research on critical success factors in agile projects with EI. Without sufficient EI, agile managed projects cannot be successful, because team members cannot collaborate effective, i.e. might struggle with challenges related to

communication, trust, motivation or anxiety. So far, the current agile literature has only identified other important critical success factors, such as the importance of quality, scope, time and costs (Chow and Cao, 2008), organizational, team and customer factors (Ahimbisibwe et al., 2015), cabablility, training and learning and communication (Ahmed et al., 2018) or company culture, prior agile and lean experience, management support and value unification (Kalenda et al., 2018).

Second, this research also contributes to research efforts on the vital role of EI in the workplace of different kinds of professions. Consistent with past studies it supports the argument that EI is a significant predictor for job performance beyond the effect of general mental ability. For example, Wong and Law (2002) reported significant positiv effects of EI on job performance and attitude based on a sample of business students, Law et al. (2008) found significant positiv effects of EI on job performance and life satifsaction for research and development scientist, Trivellas et al. (2013) reported positiv effects of EI on job satisfaction when analysing nursing staff in hospitals or Chen et al. (2015), who found that EI has a positiv relationship with work performance.

Third, it has been ilustrated that PSM can be applied in a non-experimental study related to psychological and organizational research in the context of IS-professionals in order to estimate causal effects. Although, PSM has gained popularity in fields such as economics, epidemiology, medicine and political science (Stuart, 2010), due to a lack of understanding of the underlying principles of PSM techniques, is has yet not been widely applied in psychological research (Harder et al., 2010). Consequently, similar studies investigating IS-professionals' EI have applied more common statistical techniques, such as ANOVA (Kosti et al., 2014), Path Analysis (Lee et al., 2017) or SEM (Rezvani and Khosravi, 2019).

Fourth, an increasing body of literature has reported human related challenges perceived by agile team members (Conboy et al., 2011, Lalsing et al., 2012, Javdani Gandomani and Ziaei Nafchi, 2016). Yet, there has been a lack of a practical tool to quantify these challenges. This paper has developed the HRACI, which has demonstrated good internal validity for all its dimensions. The HRACI will be beneficial for researchers who are interested in a deeper understanding of how different kinds of challenges are related to each other but also to other individual characteristics and other concept than EI, such as cultural background, gender or working experience.

5.5. Contribution to Practice

Since this research examined human related challenges occurring in agile teams, the outcomes of this research benefit organizations and professionals who are curious to understand the impact of EI on team work and project success in agile managed software development projects. This certainly relates to IS-professionals and project managers who apply agile practices. Yet, the findings have also implications for the required abilities of IS-professionals to better adapt to agile practices and are thus also beneficial to human resource practitioners, who staff and train IS-professionals.

5.5.1. EI IS AN ESSENTIAL ABILITY FOR AGILE TEAMS TO BE SUCCESSFUL

Leveraging EI in today's work environments can help to reduce occupational stress, increase effective communication between generation gaps, and reduce conflict in toxic work environments (Nguyen et al., 2019). This study provides support for researchers who have argued that prior research has focused on technical skills of software developers on project outcome, yet underestimated social and emotional skills (Rezvani and Khosravi,

2019) and that hence organizations should not simply hire IS-professionals based upon their technical strength, but also pay attention to their EI and communication skills (Hendon et al., 2017). In the same vein, Cram (2019) argued that organizations should not only select the appropriate agile practices to be applied for a particular software project, but also employees who should participate based on their abilities.

Having certain educational credentials and work experience are not enough and it requires to pay attention to your emotions and practicing self-control to ensure that you are rational (Nguyen et al., 2019), because EI plays a key role in social situations, instilling feelings of trust and cooperation, in particular in highly stressful work conditions, such as complex projects (Rezvani et al., 2016). Therefore, for agile to work well, it is crucial to select the right people for the right team (Lalsing et al., 2012, Kalenda et al., 2018) and human resource practitioners should select employees not only based on their technical skills, but also if they can express their expertise with the use of positive EI (Hendon et al., 2017).

5.5.2. EI SHOULD BE TRAINED TO INCREASE TEAM WORK AND PROJECT SUCCESS

Observing and enhancing our EI skills should be done with every interaction, because continuous effort to improve EI will lead to enhanced communication skills, better team environments and increased productivity (Nguyen et al., 2019). Hence, organizations should empower their developers with EI skills by providing an appropriate training program (Rezvani and Khosravi, 2019). In fact, preliminary evidence exists that EI indeed can be trained (e.g. Nelis et al. (2011), Lopes (2016) or Mattingly and Kraiger (2019)). Compared to more long-term or costly talent management approaches, EI training programs can provide a more immediate benefit to organizations, such as improved performance and affective outcomes (Mattingly and Kraiger, 2019).

5.6. Future Directions

The results of this study are based on a sample that only includes IS-professionals and hence the generalizability of the findings is limited to this domain. Yet, this creates research opportunities for future researchers to examine if the preliminary findings of this study can be extended into other domains. This is in particular important, as although originally designed for software development, due to its success agile has now also spread to non-IS projects (Serrador and Pinto, 2015, Hoda et al., 2018). For example, organizations realized that agile practices with their emphasize on process flexibility and quick delivery of value can help them to bring products and services to market quickly and adapt nimbly to changes in the technology landscape (Ramesh et al., 2019). As a result, agile has also moved into mainstream thinking as management practice (Birkinshaw, 2019) and agile management is now spreading to every kind of organization and every aspect of their work, such as human resources, finance, legal, marketing or sales (Denning, 2016). Furthermore, human-related challenges related to anxiety, motivation, mutual trust or communication competence are not limited to collaboration in agile teams, yet occur in everybody's daily life whenever people socially interact.

Moreover, the importance of EI for agile projects might even become more important with the emerge of AI. Recent research suggests that AI might assist human programmers in coding, e.g. AI could act as pair programming partner or humans could focus on writing test cases and AI would create the corresponding code (Mithas et al., 2018). However, AI is less suitable for unstructured tasks, such as interacting with others or the potentially emotionally fraught tasks of communicating (Brynjolfsson and Mitchell, 2017). Thus, with the dispersion of AI the human role in agile might shift from coding into primarily focusing

on unstructured tasks, such as organizing and collaboration. This then might result in more human related challenges if the IS-professionals lack sufficient EI.

5.7. Chapter Summary

This chapter discussed the limitations and conclusions of this study. This was followed by presenting the contributions to theory and practice. Finally, future research directions were proposed.

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APPENDIX 1 – WEB SURVEY

Participant Information

* Required

Purpose

The purpose of this research is to investigate the existence of acausal inference between human related challenges perceived by agile team members and their emotional intelligence.

Participation

The University of Bradford supports the practice of protection for individuals participating in research. The following information is provided for you to decide whether you wish to participate in the present study. Participation is voluntary and anonymous. You should be aware that even if you do agree to participate in this study, you are free to withdraw from it at any time.

Procedure

The online survey will take approximately 6 minutes to complete and will ask you about your experiences in the following areas:

- Some information about you
- Your experiences of working in IT projects
- Your knowledge about your own and other people's emotions

Benefits

You will receive no direct benefits from participating in this research study. However, your responses may help us learn more about human related challenges perceived by so many individuals working in agile managed projects. The findings of this research could assist in improving agile practices and disburden the working life for many affected individuals.

Risks

This study constitutes minimal risk, meaning that the probability and magnitude of physical or psychological harm anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life. Ethics approval has been granted by the Chair of the Humanities, Social and Health Sciences Research Ethics Panel at the University of Bradford on 24/04/18.

Confidentiality

Everything you report is confidential.The information you give may be used for this research, but it will not be possible to identify you from our research report or any other dissemination activities.

Contact Information

Researcher: DBA (c) Tan Trung Luong T.T.Luong@bradford.ac.uk

1. Supervisor: Dr Uthayasankar Sivarajah U.Sivarajah@bradford.ac.uk
2. Supervisor: Prof Vishanth Weerakkody V.Weerakkody@bradford.ac.uk

Institution: University of Bradford, Faculty of Management and Law

Electronic Consent

You may withdraw your consent to participate in this study at any time.

Please select your choice below. You may print a copy of this consent form for your records. Clicking on the "Agree" button indicates that

- You have read the above information
- You voluntarily agree to participate
- You are 18 years of age or older

*

- Agree
- Disagree

NEXT

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Participant Information

* Required

General Information

Gender *

- male
- female

Cultural Background *

- German
- Chinese
- Indian
- Other: _____

Educational Background *

- informatics or computer science
- business or economics
- engineering
- Other: _____

Age *

- young adults (18 - 25 years)
- adulthood (25-40 years)
- middle age (40-60 years)
- older age (> 60 years)

Have you received a special Emotional Intelligence training in the past? *

- yes
- no

In which methodology do you mainly work? *

- agile (e.g. Scrum, XP, Kanban)
- plan-driven (e.g. Waterfall)
- hybrid (agile and plan-driven)
- Other: _____

What is your role in the agile team? *

- technical consultant (e.g. developer)
- functional consultant (e.g. business analyst)
- lead consultant (e.g. scrum master, product owner)
- Other: _____

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APPENDIX 2 – WONG AND LAW EMOTIONAL INTELLIGENCE SCALE

Self- Emotion Appraisal (SEA)

1. I have a good sense of why I have certain feelings most of the time.
2. I have good understanding of my own emotions.
3. I really understand what I feel.
4. I always know whether or not I am happy.

Others' Emotion Appraisal (OEA)

1. I always know my friends' emotions from their behavior.
2. I am a good observer of others' emotions.
3. I am sensitive to the feelings and emotions of others.
4. I have good understanding of the emotions of people around me.

Use of Emotion (UOE)

1. I always set goals for myself and then try my best to achieve them.
2. I always tell myself I am a competent person.
3. I am a self-motivated person.
4. I would always encourage myself to try my best.

Regulation of Emotion (ROE)

1. I am able to control my temper and handle difficulties rationally.
2. I am quite capable of controlling my own emotions.
3. I can always calm down quickly when I am very angry.
4. I have good control of my own emotions.

APPENDIX 3 - HUMAN RELATED AGILE CHALLENGES INVENTORY

1. Anxiety caused by Agile Practices (ANX)
    - When I know that I cannot deliver a task in a given time, I feel anxious to report this, because I do not want to appear less competent than other team members or similar reasons.
    - In discussions related to domains, where I am not so good at, I do not raise my concerns, because I feel anxious to expose my skill deficiencies or similar reasons.
    - I feel anxious, when asked to make estimates, because I do not want to be perceived as incompetent for potentially making wrong estimates or similar reasons.

2. Motivation to apply Agile (MOT)
    - If I am not convinced that agile methods works for me, I have difficulties to motivate myself.
    - If I do not want to transit from plan-driven to agile, I have difficulties to motivate myself.
    - If there are no clear reasons to use agile methods, I have difficulties to motivate myself.

3. Communication in Agile Teams (based McCroskey (1988)) (COM)
    - I have difficulties to talk to team members I do not know long enough.
    - I have difficulties to present my work to team members I do not know long enough.

- I have difficulties to talk in meetings with team members I do not know long enough.

4. Trusting unknown team members (TRU)
    - I have difficulties to trust team members that I do not know long enough.
    - I have difficulties to trust team members that I do not have sufficient face-to-face interaction with.
    - I have difficulties to trust team members from cultural backgrounds that I am not familiar with.

APPENDIX 4 – ETHICS APPROVAL

Tue 24/04/2018 17:41

Ethics <ethics@bradford.ac.uk>

Approval: Ethics Checklist EC25042

An 'Tan Trung Luong'; Andrew Smith

Cc Sankar Sivarajah; Vishanth Weerakkody

Sie haben diese Nachricht am 06/05/2018 05:48 weitergeleitet.

Dear Andrew & John

Ethics Checklist: EC25042
Title: Is Emotional Intelligence a root cause for human related challenges perceived by agile team members?

Apologies for the delay in getting back to you about this, however, your ethics submission and documents have now been reviewed by the Chair of the Research Ethics Panel.

I am pleased to inform you that the Chair has confirmed approval of this study, with no further ethical scrutiny required.

NOTE that this approval is for this study only.

Should there be any changes to this study, you must inform ethics@bradford.ac.uk.

Once your changes have been reviewed and you have approval to proceed, only then can you recommence the study.

Failure to do so will render your original approval invalid and withdrawn.

Please add a sentence onto any material you share with participants confirming that ethics approval has been granted by the Chair of the Humanities, Social and Health Sciences Research Ethics Panel at the University of Bradford on 24/04/18.

Regards
Jagruti

Jagruti Lad

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For NHS Ethics, REC and IRAS queries, please email nhs-ethics@bradford.ac.uk