University of Twente

MSc Business Administration - Purchasing & Supply Management

Master Thesis

High Tech With a Human Touch: Leaders' and Employees' Emotional Intelligence For Employees' Support For Radical Technical Innovation Projects: A Mixed-Method, Multi-Level Exploratory Study

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Preface

In front of you lies the master thesis “High tech with a human touch: leaders’ and employees’ emotional intelligence for employees’ support on radical technical innovation projects: a mixed-method multi-level exploratory field study”. The basis of which is a multi-level semi-structured interview and a survey within two high tech industrial companies in their quest to adopt radical technical innovations such as I4.0 applications. This thesis has been written to accomplish the requirements for graduating from the University of Twente, MSc Business Administration – purchase & supply management. I started researching and writing this thesis in late 2018 until mid-2019. With the assistance of my supervisor, Desiree van Dun Ph.D., did the research question, although altered throughout the process, take shape. The study that I conducted was not without barriers. After an extensive search, multiple company visits, many phone calls, and numerous emails, I finally found the right sample to conduct my study. After extensive qualitative and quantitative research, I was able to answer my research question. During my study, my supervisors Desiree van Dun Ph.D. and professor Celeste Wilderom were there for me when requested. They have always progressively answered my questions for guidance so that I could progress with my study. Thank you both for the pleasant guidance. From my home base, I sincerely thank my fellow Honours/ Excellence “Change Leaders” classmate and partner, Sogol Fathi Afshar for her inexhaustible patience and her always constructive feedback. I would also like to thank all the participants in this study for their willingness to cooperate. Furthermore, my parents and sister, Dinant, Gea, and my sister Ineke, for debating, giving perspective, and motivating me when necessary throughout the study. I like to thank Robbert Verhulst, my co-worker and above all, close friend, for your clear thinking and decision-making advice. Shannon van Hoorn, thanks for your time when I needed it, it helped me a lot! Livandro Gulati, Thank you. We both started this whole journey during our Bachelor Industrial Engineering, then the Pre-master and finally, we struggled through this chapter side by side. Thank you for the hours spend together, studying, rehearsing, and practicing. Without the support of Desiree, Sogol, Celeste, my parents Dinant & Gea, Ineke, Robbert, Shannon, Livandro, and the participants, I would have not been able to finish my study.

Wishing you pleasure and new insights while reading this study,

Mark van Duuren, Zwolle, 15th of June 2019

Abstract

Purpose: the aim of this explorative study is to examine how radical technical innovations, such as Industry 4.0 change projects, can be implemented more successfully in the Netherlands. We propose that the effects of leaders' and employees' emotional intelligence (EI) positively contributes towards employee support for adoption of radical technical innovations. We assume that greater employee support increases the probability to adopt radical technical innovations such as I4.0 projects.

Design/methodology/approach: Two leading technical industrial companies in the process of I4.0 innovation projects were analysed. A mixed-method approach was employed: a multi-level, exploratory field study to develop in-depth insights into I4.0 adoption and employee support. Multiple surveys (n = 20), and semi-structured interviews were performed with leaders at two hierarchical levels (n = 6) and work-floor level employees (n = 8). The quantitative results were analysed through correlation, independent sample T-tests, and regression analyses. Subsequently the findings from the semi-structured interviews and the multilevel quantitative analysis were triangulated to answer the research question.

Findings/practical recommendations: The results show that when employees, team leaders, and high-level leaders score high on EI, and when management and organisational support is high, this relates to a high radical technical innovation support among employees. Practical recommendations include a measurement of employees' EI in view of radical technical innovations; training and education on EI relates to a higher adoption for radical technical innovations.

Limitations: Since this is an explorative study, a small sample size was expected and found. The EI topic had proven resistance among employees and the majority of Dutch contacted organisations appeared not fully I4.0 ready and were therefore not applicable for this study

Originality/value: The main contribution of this research is to connect and broaden the understanding how leaders' and employee's emotional intelligence contribute to employee's support of Industry 4.0/ radical technical innovation projects. The relation between leaders and employee's emotional intelligence has been addressed before and, similarly, Industry 4.0 is a current wide expanded, however not fully understood topic in literature and practice. This study explores an entire new research topic, relationships, and undiscovered territory.

Keywords: Industry 4.0, Smart Industry, Technology Support, Multilevel Leadership, Emotional Intelligence, Employee Resistance to Change.

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Abbreviations

AR	Augmented Reality
CIT	Critical Incident Technique
CPS	Cyber-Physical-Systems
DE	Douwe Egberts
ERP	Enterprise Resource Planning
EQ	Emotional Quotient
EC	Ethics approval Commission
FME	The Federation of Metal and Electronic industry
I3.0	Industry 3.0
I4.0	Industry 4.0
ICT	Information and Communication Technology
IoT	Internet-of-Things
IQ	Intelligence Quotient
IU	Intention to Use
MEIS	Multifaced Emotional Intelligence Scale
MES	Manufacturing Execution Systems
PEU	Perceived Ease of Use
PU	Perceived Usefulness
TAM2	Extended Technology Acceptance Model
TAM	Technology Acceptance Model
SME	Small Medium Enterprises
VR	Virtual Reality

Introduction

After the revolution of steam and water power in 1780, electricity and the use of assembly lines around 1880, and automation in 1969 (Drath & Horch, 2014), we are now on the verge of the fourth industrial revolution. This Industry 4.0 (I4.0), or smart industry, involves smart production, smart manufacturing, Cyber-Physical-Systems (CPS), and Internet-of-Things (IoT) (Liao, Deschamps, Loures, & Ramos, 2017; Tortorella & Fettermann, 2018). The fourth industrial revolution is different compared to the previous three, because it will forever change the way how humans are involved with technology (Schwab, 2017). 'I4.0 is identified as a radical and unstoppable change that involves a major contribution to the digital, automated and autonomous business environment' (Kamble, Gunasekaran, & Gawankar, 2018, p. 1). This fourth revolution indicates a complete integration of factories and Information- and Communication Technology (ICT) of which computers and machines emerged that can think without the need for human intervention. However, despite the growing interest in I4.0, numerous organisations are struggling on how to implement I4.0 in their daily operations (Erol, Schumacher, & Sihn, 2016; Sanders, Subramanian, Redlich, & Wulfsberg, 2017).

The Federation of Metal and Electronic industry (FME) is an organisation that aims to let I4.0-enthusiast companies connect with each other and combine knowledge and experience for better I4.0 implementation. FME is the largest Dutch industry association specialized in innovation regarding smart industry which makes it a suitable source for this research. FME-listed organisations apply digitization, robotization, and big data as components of I4.0 in the technology industry. These organisations constantly introduce new technological products and services into the market. Digitization in the Netherlands, as well as internationally, is a dominant development that takes place at a very high pace (Pot, 2014). Smart industry is often considered as the innovation of processes, whereas the development of new products and services are seen a 'real' innovation. Presumably for its clearer, tangible, radical nature and recognisability.

When defining I4.0, or smart industry, most scientists refer to 'the usage of the IoT and CPS' (Fatorachian & Kazemi, 2018, p. 2). Fatorachian and Kazemi (2018) explain that I4.0 involves the integration and connection of the virtual and digital world through CPS and IoT. In this virtual and digital world, smart objects continuously interact and communicate with each other without human intervention. The term CPS refers to the coordination and

appropriate collaboration between cyber-physical-systems and computers. This means that physical elements and software components are deeply interwoven (Fatorachian & Kazemi, 2018). These physical machines and their software enable intelligent applications and software to interact and communicate without a human factor interfering. As a result, autonomous production is realized without intervention (Thoben, Wiesner, & Wuest, 2017). Therefore, it might be assumable that when people acknowledge that their job may be in jeopardy by I4.0 technology taking over their work, this will create a great deal of resistance among the potentially unemployed employees. Several studies have been conducted to understand this reasonable threat (Shimoni, 2017; Vos, Sylva, Ponfoort, Oukhiar, & Vermeulen, 2017).

Berenschot, an independent management consultancy, studied on behalf of FME, 6.971 employees in the technology industry about their thoughts and emotion following these disruptive changes because of I4.0 (Vos et al., 2017). According to that research, 91 percent of employees perceived that the company where they worked for applied new technology. Within these 91 percent, 61 percent expected clear changes in the work (Vos et al., 2017). The key to understanding the resistance to change is usually not about understanding the technical changes themselves, but the social change that comes along with the technical changes. This includes the changes in the relationship amongst employees, team leaders and high-level leaders that usually accompany technical changes (Shimoni, 2017). To implement such technical changes in I4.0, logically a change within companies is required to go from industry 3.0 to I4.0. Figure 1 illustrates the changes in industry revolutions.

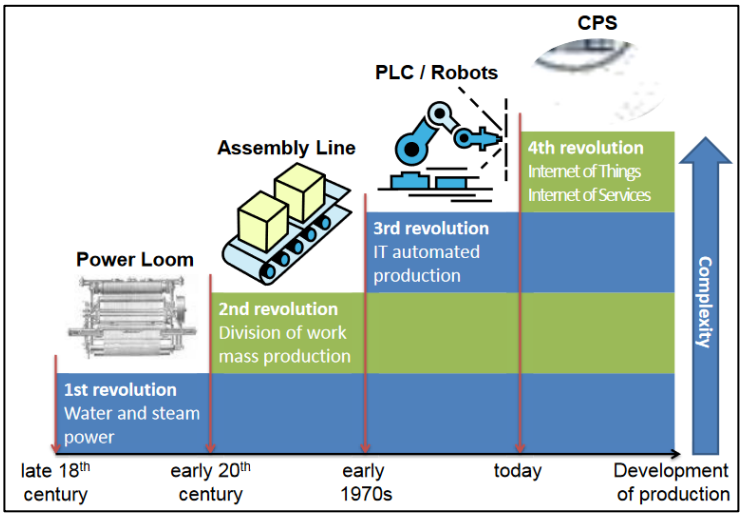

Figure 1. Four Industry Revolutions. Reprinted from "Industrie 4.0" and Smart Manufacturing – A Review of Research Issues and Application Examples by K-D. Thoben, S. Wiesner, and T. Wuest, 2017, *International Journal of Automation Technology, 11,* p. 1.

Industry 3.0 focused on the introduction of applications for computers, digital programming for automation, and electrical gadgets. Organisations have thus gone through various changes before: from steam and water to electricity, and from paper to digital work. However, because of the implementation such as CPS and its characteristics, the fear of replacement of the human involvement and its right to exist in the job has not been that evident yet (Thoben et al., 2017). The human involvement will per definition be at stake in I4.0 within its optimal form, wherein the human factor is completely removed from the process: autonomy instead of automated (Thoben et al., 2017). Therefore, resistance among employees towards radical technical changes such as I4.0 is expected to be greater than with regular changes. Schwab (2017) describes the influence of I4.0 on humankind:

> "It (I4.0) will influence how we meet people and nurture relationships, the hierarchies upon which we depend, our health, and maybe sooner than we think, it could lead to forms of human augmentation that cause us to question the very nature of human existence. Such changes elicit excitement and fear as we move at unprecedented speed" (p. 57)

Furthermore, support for change is partly due to how a leader supports and facilitates changes towards employees. Considering that the support of the employees on the I4.0 changes depends on their direct supervisors; it is reasonable to assume that those managers have a great deal of influence on the acceptance of the change by the employees. Additionally, chances are that hierarchical executives who must support projects have considerable influence on the attitude of their employees as well (Kotter, 1990; Lukes & Stephan, 2017). Therefore, this study explores the support of team leaders of I4.0 projects as well as high-level leaders.

In terms of effective leaders of change, a leader's level of Emotional Intelligence (EI) is noted to have a major influence on their communication with employees as well as employees' satisfaction, job satisfaction and incremental validity (Bagshaw, 2000; Goleman & Boyatzis, 2017; Miao, Humphrey, & Qian, 2016; Wong & Law, 2002). Moreover, leaders who score high on EI are seen to be more effective at work (Wilderom, Hur, Wiersma, den Berg, & Lee, 2015). Furthermore, the presence of employees' EI contributes to an increment of employee collaboration, motivation, less stress, life satisfaction and productivity (Johnson & Indvik, 1999; Naseem, 2018). Goleman (1995) explains that EI is the single most important trait of intelligence to have, and defines EI as the ability to recognise, evaluate and regulate one's own emotions, the emotions of others, and that of groups (Goleman, 1995). Goleman

(1995) added that EI is twice as important as any other thing for successful leadership. In addition, EI is "the capacity for recognizing our own feelings and those of others, for motivating ourselves, and for managing emotions well, in ourselves and in our relationships" (Bagshaw, 2000, p. 61). Interestingly, several studies found that EI is a core variable which affects the leaders' performance (Cavazotte, Moreno, & Hickmann, 2012; Chuang, Judge, & Liaw, 2012; Hur, van den Berg, & Wilderom, 2011; Lam & O'Higgins, 2012; Walter & Bruch, 2009; Wang, Oh, Courtright, & Colbert, 2011; Wilderom et al., 2015), and thus EI might be a key enabler for employees to support I4.0 change projects.

However, little research has been done on the relation of employees'-, leaders'- and high-level leaders' EI on support for employees in radical technical innovation, such as I4.0 change projects. Therefore, this study tries to fill that gap. The central research question of this paper is as follows:

"How do top leaders', department leaders', and employees' emotional intelligence affect employees' support for radical technological innovation projects, and how does this relate to technology adoption?"

The following sub-questions support the research question:

1. To what extent and how do the hierarchical leaders and employees of radical technological innovation projects display emotional intelligence?
2. To what extent is there a difference in the EI shown by leaders and employees at three different hierarchical levels?
3. To what extent do employees experience organisation support for innovation?
4. How do the employees support I4.0 change projects?
5. To what extent is there radical technological innovation adoption as a result?

This multi-level, mixed-method, explorative study contributes to the existing literature in several ways. First, by assessing whether EI should be nurtured or invested for a satisfying influence on employee acceptance on radical technical innovations such as I4.0 change projects. Secondly, this study contributes and assesses whether EI should be mentored or developed for further leadership practices, including to which extent technology acceptance relates to I4.0 adoption. Third, this study provides organisations in the industrial technology sector exploratory evidence about the EI of their leaders as well as their employees. Furthermore, this study increases the understanding of EI within leaders and employees and

their support in I4.0. Moreover, this study provides practical insights for the investigated companies and comparable industrial companies on how hierarchical leaders' EI influence the employees' acceptance of I4.0 projects. This may be directly applicable in the case of recruitment and selection for new I4.0 change project leaders, or to prepare employees for I4.0 projects. Additionally, this study may help companies to adjust their strategies towards leadership or employees' behaviour on existing or starting I4.0 or other radical change projects. In turn, this may boost the effectiveness of the implementation of the resource-intensive investments that I4.0 changes typically require.

Theoretical Background

This section will describe the definition and origin of I4.0 as a current example of radical technical innovation. It will explain the most important I4.0 characteristics such as CPS, and its effect on people. Then, the literature on change management and support and resistance of employees to radical technical innovation projects will be reviewed. The last part will go deeper into the subject of EI, its origins, and its importance. Sources are gathered mostly from Web of Science, Scopus and Google Scholar.

I4.0 as Radical Technical Innovation Adoption

I4.0 was first named in an announcement by Kagermann in 2011, in Germany during the Hannover Fair (Kagermann, Lukas, & Wahlster, 2011; Liao et al., 2017; Stock & Seliger, 2016). Since that first announcement, the scientific publications are raising significantly (Liao et al., 2017; Torn, 2018); research has increased more than six-fold from just 136 in 2014 to around 912 in 2017 (see Appendix 1). However, despite the fact that the literature provides more than 100 definitions about I4.0, no real unanimous definition has been defined. This indicates that we are still at an early stage and that there is still much to debate about the precise definition of I4.0 (Moeuf, Pellerin, Lamouri, Tamayo-Giraldo, & Barbaray, 2018). Nevertheless, the values are already clearly visible. An increase in turnover has been seen thanks to investments in I4.0 applications, with for example, an average increase of 3.3 percent annual turnover in German industrial firms being observed (Koch, Kuge, Geissbauer, & Schrauf, 2014).

The fourth industrial revolution defines the exponential radical innovative changes in the way people work, live and how they both relate to each other due to the implementation innovations such as CPS. While the public implements smart technology in their homes, into their factories and workplaces, many of these smart systems are already interconnected, are responding and are anticipating with each other. These smart systems will for example, interact and picture the whole production and supply chains, while making autonomous decisions based on real time data. I4.0 offers a broad new perspective for the industrial management and leadership of SME's. Strengthened by an increasing count of new technologies, the concept of I4.0 seems less expensive and more flexible than previous and traditional innovations, such as Enterprise Resource Planning (ERP) and Manufacturing Execution Systems (MES) (Rawat, Brecher, Song, & Jeschke, 2017).

The I4.0 revolution is an example of a present stream of radical technical innovations and can be classified in three dimensions: 1) horizontal integration across the entire value creation network; 2) end-to-end integration across the entire product life cycle and; 3) vertical integration networked manufacturing systems, and is expected to influence every discipline, industry, and economy (Kagermann, Helbig, Hellinger, & Wahlster, 2013; Liao et al., 2017; Lom, Pribyl, & Svitek, 2016; Stock & Seliger, 2016). I4.0 is therefore applicable in every process and in every layer.

In some aspects, I4.0 can be seen as an extension of the third industrial revolution, the digital revolution. However, because of its scope, its velocity, and the impact on systems, the changes committed in the fourth revolution are a different area. In literature, I4.0 is described as the concept based on the development of new technology, such as CPS, IoT, cloud computing, robotics, artificial intelligence, 3D printing, autonomous vehicles, energy storage, material science, and big data, to name a few (Schwab, 2017). These technologies will progress the spread of data through the entire value system. Therefore, I4.0 enables better demand and control, and allows processes to adapt in real time according to erratic mandate (Fatorachian & Kazemi, 2018; Moeuf et al., 2018; Thoben et al., 2017). I4.0 disrupts essentially each industry in every country and creates immense changes in a non-linear movement with extraordinary swiftness, in scope, scale and complexity never experienced before in human history (Schwab, 2017).

However, most scientists define I4.0 primarily as the use of IoT and CPS (Fatorachian & Kazemi, 2018; Mazali, 2018; Thoben et al., 2017). CPS is referred to as ‘a combination of and coordination between the physical assets and their computational capabilities’ of which the components of CPS are referred to as ‘deeply intertwined interacting with each other in diverse ways that change with context’ (Dassisti, Giovannini, Merla, Chimienti, & Panetto, 2018, p. 42). In fact, the benefits of CPS are diverse. CPS controls machines and systems with highly intelligent software, enabling autonomous production (Lom et al., 2016). CPS thus enables the communication between cyber and physical systems, which creates IoT. Bures et al. (2015) mentioned that CPS has been under the spotlight in the academic community and industry for almost a decade. CPS is recognized by agencies around the world as a very high interest and priority for innovation and research funding. Therefore, CPS can be seen as a foundational base and the main source for I4.0. An example of CPS is electricity networks or traffic management. A trend that has been observed, is the necessity and possibilities to support these systems with "smart" possibilities, such as self-awareness and self-adaptability, combined with general safety rules, reliability and quality characteristics (Bures et al., 2015).

CPS ultimately works without any human involvement. For this reason, it is likely to assume that CPS forms the biggest threat for employee employment within this radical technological innovation of I4.0

The difference between I3.0 and I4.0 is that the former is producing automatically and that the latter will produce, adapt and take action autonomously between systems (Pieroni, Scarpato, & Brilli, 2018). An example of I3.0 is the coffee machine from Douwe Egberts (DE). These machines, often used in Dutch government buildings, are automated. During I3.0, the machine itself could automatically signal malfunctions or the need for a refill, because of an electronic Kanban system (Piplani & Ang, 2018). In turn, the technician knows the status of supplies and can act to, either order new coffee and manually (re)fill it on time, or to read out the error codes and carry out a repair. However, the step in I4.0 is autonomous instead of automatic, which means that the machine itself can make its own choices. Coffee orders and maintenance are based on analyses of which autonomous machine operations can be based on artificial intelligence, e-Kanban, expert settings or even pre-programmed algorithms, after which no human interaction is needed anymore (Hwang, 2016; Junior & Godinho Filho, 2010; Xu & Duan, 2018). For example, the DE coffee machine itself knows that the coffee is almost empty. It will then send a signal to an online platform where coffee is ordered. This coffee will arrive just in time at the machine and will be refilled hypothetically by means of a drone.

The involvement of CPS and other autonomous I4.0 characteristics in our work and the private related environment will lead to radical technical changes in how we work, live and experience daily life. Yet, when these innovation changes are guided poorly, they will encounter resistance among its end users (Stouten, Rousseau, & De Cremer, 2018). Moreover, recent studies concluded that Dutch SME's find themselves poorly prepared to be ready for this radical change towards the fourth industrial revolution (Moeuf et al., 2018; Ruiz-Rodríguez, Lucendo-Monedero, & González-Relaño, 2018). This makes an effective change leader necessary to assist and to reach the desired I4.0 change, and not to revert back to the old situation (Al-Haddad & Kotnour, 2015).

Hierarchical Leaders Support for Change and Innovation

Hierarchical support for innovation drives employees innovation acceptance and support (Hunter, Bedell, & Mumford, 2007; Lukes & Stephan, 2017). The hierarchical support can be defined as experienced support by the employee from the hierarchical leaders who encourage and facilitate new innovative suggestions (Oldham & Cummings, 1996). From the organisations perspective, positive effects on the innovative behaviour and acceptance of employees occur when hierarchical leaders support innovative ideas, use rewards, and facilitate resources for the implementation of innovations (Lukes & Stephan, 2017). From the employees perspective, the assessment of their leaders is imperative and encourages the employees to engage in inventive behaviour (Amabile, Schatzel, Moneta, & Kramer, 2004; Patterson et al., 2005).

However, it is a common fact that roughly 60 percent of innovation changes in organisations does not reach its wanted end-state because of insufficient leadership (Beer, Eisenstat, & Spector, 1990). In addition, Levy (2018) stated that 70 percent of change processes fail (Levy, 2018). Moreover, Al-Haddad and Kotnour (2015) even stated that less than 30 percent of change processes succeed (Al-Haddad & Kotnour, 2015). When leaders make incorrect actions to communicate the change it may result in costly outcomes (Hayes, 2014). According to Hayes (2014), change leaders are frequently mistaken because they fail to see some of the key dynamics in communication with employees, which affect the support and consequently the results (Hayes, 2014). Subsequently, leaders do not constantly perform in such behaviours which let them keep a necessary hold over what is going on in the process. Leaders throughout the whole change project process need to attend to people's issues. Nevertheless, leaders often misjudge the first steps of the change process. They often treat them as merely technical steps that can be managed, without regard to people who are going to feel the effects of these changes (Hayes, 2014). It is certainly not unusual for so-called expert change leaders to simply implement the process steps without taking the stakeholders into the process, and forgetting that these stakeholders have the power to sabotage or support the process (Hayes, 2014). Additionally, Hayes (2014) includes that leaders often make use of change management models to guide them in their change process to minimize the resistance and increase the change of a successful implementation.

In literature, three change management models stand out and are still being used today in their original form, or slightly adjusted. These models are the three-stage model of Lewin, Kotter's eight-step model and Prosci's ADKAR (Dijesh & Mary, 2017). These models focus on different aspects of change leadership and have different visions, whereas some basic

similarities can be found when comparing them. Lewin's model focused on group behaviour and values, Kotter emphasized to create a complete and fertile base for maintainable change in businesses, and ADKAR focused on individual change and goal-oriented business outcomes. However, all three models have similar thoughts on 1) creating the urgency, the reason for change and the emphasis on awareness and desire of change; 2) communication and information; 3) leadership and leader support; 4) enable employees' to change and assisting them taking information to action and, 5) celebrating successes (Dijesh & Mary, 2017; Hayes, 2014; Stouten et al., 2018). Interestingly, the first three similarities give reason to look at the leaders' behaviour, communication, and support towards their employees regarding change. Hayes (2014) states seven responsibilities that leaders need to execute that one may guarantee successful change:

> "1 Sensemaking: making sense of the world and identifying the opportunities and threats that require attention. 2 Visioning: identifying a vision of what a more desirable state of affairs might look like and what needs to be done to move towards this better future. 3 Sense-giving: communicating the vision to a wider audience and responding to feedback as required to win a commitment to the change. 4 Aligning: Promoting a shared sense of direction so that people can work together to achieve the vision. 5 Enabling: Removing obstacles and creating the conditions that empower others to implement the change. 6 Supporting: Recognizing and responding to the concerns of those affected by the change. 7 Maintaining momentum and sustaining the change: Showing commitment and 'walking the talk' to keep people focused on the change" (Hayes, 2014, p. 163).

Consequently, the leader has great influence and responsibility in the desired outcome of the change project, while focussing on the employees to support the change project during the process.

Employee Support for Change

New technological innovations that come with I4.0 influences the employees' way of working. The range of new technology varies from those who give information to its user, to real-time autonomous adjustments of the process. An example is an all integrated tablet connected with an ERP in a way that the whole factory can be monitored and maybe even controlled from home (Olaf & Hanser, 2019). It could also illustrate more complex systems, where robotics use quantum technology to decide when, how, and to what extent they allow the handled part to autonomously enter the machine and to undergo construction, or

maintenance with consequential procedures (Olaf & Hanser, 2019). Excellent system and production performance might be interesting or sufficient for managers and the technician. However, it might be more important that the technology and equipment are attractive and acceptable for the end-user (Kremer, Villamor, & Aguinis, 2019; Rothengatter, 1991). In systems used for training or advisory, the key issue of determining the feasibility is the apprehension of a social context when introduced and worked with (Rothengatter, 1991).

A requirement for support or acceptance with new technology starts and ends with its users. According to Venkatesh and Davis (2000), the intention to use new technology is strongly connected to the perceived simplicity of use, which is connected to the experienced usability of the technology. If something is simple to use, it probably will be used more often and more easily (Venkatesh & Davis, 2000). Without the support of its users, the investment of time, money, or effort to design smart objects and buildings is unproductive when the system is disabled or never even turned on. Logically the potentially efficient and, or, effective new technology not being used will not increase firm performance.

Employees are more likely to support change when their leaders support the change initiative and implement the movement towards the desired change themselves (Self, Armenakis, & Schraeder, 2007). Leaders have different styles of leadership which influence employees in several ways. A number of studies concluded that the employees at the centre of the change process should receive more leadership attention (Quintana, Park, & Cabrera, 2015; Slåtten, Svensson, & Sværi, 2011). Leadership can affect the employee in several areas, namely: leader-follower relationship, leader-leader relationship, job engagement, creativity, company performance, professional performance, job satisfaction, and innovative behaviour (Brownell, 2010; Rothfelder, Ottenbacher, & Harrington, 2012). Employees have turned out to be the key for innovations, stimulated by their leaders and managers to be inventive and or improve service or products towards excellence (Wong & Ladkin, 2008). In view of the support to innovative change; communication, leadership acceptance and social behaviour in firms, EI emerges as one of the three qualities that we as people possess.

These qualities: EI, intelligence quotient (IQ), and personality combined, determine how we think or act (Bradberry & Greaves, 2009). It is impossible to forecast one quality based upon another. People can be emotional intelligent, but not intellectual intelligent, while people of all kind of personalities can have a low or high IQ or EQ (referred to as EI). However, EI is the only quality which is flexible and can be improved (Bradberry & Greaves, 2009).What makes EI interesting in this study, is that it influences leaders' support for employees, which, in turn, may influence the adoption for innovation changes.

Emotional Intelligence

EI, coined by Mayer and Salovey (Salovey & Mayer, 1990), is about feeling, awareness, sensitivity and the ability to empathize with one's own feelings and those of others. EI includes the capacity for associative thinking and influences the gaining of skills (Goleman, McKee, George, & Ibarra, 2018; Mayer, 2004; Rosenbach, 2018; Turnipseed, 2018). EI can be distinguished in four branches: appraisal and expression of emotion in the self, appraisal and recognition of emotions in others, regulation of emotion in the self, and use of emotions (Wong & Law, 2002). The appraisal and expression of emotion in the self relates to the ability of the individual to understand their own deep emotions and are able to correctly express their emotions in a natural way. When people are great in this area they can recognize and sense their emotions well before the utmost people. Appraisal and recognition of emotions in others relates to people skills to understand and perceive most of the emotions of the people around them. People with great skill in this ability are probably more sensitive to the emotions and feelings of others as well as reading their thoughts. Regulation of emotion in the self relates to the skills of people to control and adjust their emotions, helping them to recover quickly from mental suffering. Use of emotions relates to facilitating performance, which relate to the skills of individuals to make use of their emotions by guiding them towards private performance and productive actions (Wong & Law, 2002). Goleman, McKee, George and Ibarra (2018) explain the difference between EI and intellectual intelligence, and its importance over intellectual intelligence regarding job or life successes. “Theoretically, people with high EI will enjoy better relationships with others, have better control over their own lives, and be able to control negative emotions” (Wong & Law, 2002, p. 252). Overall, it can be said that EI says somewhat about how somebody deals with emotions of themselves and others, and how someone replies to certain circumstances. EI is frequently associated with the factor of social success (Wong & Ladkin, 2008).

When people speak of successfully finishing a study project or achieving high scores on assessments, intellectual intelligence is expected to be used throughout the process. Intellectual intelligence represents abilities such as fluid reasoning, working memory, and short-term memory, knowledge of the world, quantitative reasoning and visual and spatial processing (Goleman & Boyatzis, 2017). However, intellectual intelligence is not a very good predictor when looking at job success (Cherniss, 2000). Additionally, IQ is only a predictor for at best 25 percent of the variance (Hunter & Hunter, 1984). Supplementary studies found out that IQ is only determinative for job success for 20 percent and that the other 80 percent is determined by other factors (Goleman, 1996; Martinez, 1997). As a matter of fact, a small

study with 80 Ph.D. students, showed that EI is four times as important as IQ. Likewise, a 40-year longitudinal study with 450 boys showed that IQ had a marginal relation on how great they scored on the rest of their life and work. It appeared that the social and emotional skills such as handling frustration, getting along with people, and controlling emotions made the biggest difference (Snarey & Vaillant, 1985). Moreover, Goleman (1998) stated that "IQ and technical skills do matter, but mainly as threshold capabilities" (Goleman, 1998, p. 92), since you need a certain grade or IQ to get for example in University of Twente or Harvard. This indicates that people have more chance to succeed in life when they can manage their own emotions and those of others.

When leaders and employees have a higher EI, it is most likely that it aids in the support for change, since they are more sensitive towards emotions and feelings of themselves and others. In addition, high EI appears to increase the likelihoods of success (Wong & Law, 2002). Bagshaw (2000) mentions that when people work in a workplace and act with a low level of EI, this can be of great consequences and great costs. Stress, low morale, conflicts, miscommunications, and decreasing performance can all limit business and group success.

> "Recent research clearly shows that EI is the 'sine qua non' of leadership. Without it, a person can have the best training in the world, an incisive, analytical mind, and an endless supply of smart ideas, but he still won't make a great leader" (Goleman, 1998, p. 92).

When a high-level EI is observed, this can correlate with positive business effects by increasing and improving teamwork, handling customer service, dealing with changes and accepting challenges (Bagshaw, 2000). The good news is, that the level of EI can increase through training and exercise (Bagshaw, 2000; Bradberry & Greaves, 2009).

EI should be trained by capable trainers who have experience in conflict management, assertiveness, active listening skills, and stress management, such as handling new and uncertain situations. These skills can be strengthened by training EI. However, while these skills can be leveraged by training, they should be continuously honed and improved during one's life, if only tacitly (Bagshaw, 2000). Important to mention is, that the people who are getting EI training, must be ready to take these lessons. Most likely the topic on EI will arouse emotions more than other topics would. Therefore, it is important to create a feeling of safeness, being aware of any vulnerabilities in the group (Bagshaw, 2000). Improving one's EI has great results for one's behaviour, one's success in life and work and overall happiness when handled with proper training and coaching (Bagshaw, 2000). Doing so, EI can rapidly

become of great value to the organisational capital and speed up and maintain the innovative change process.

For this study, a conceptual model illustrates how the various components theoretically have a positive effect with each other, in view of the theory described above about I4.0, employee support, company support, and EI. (See Figure 2.)

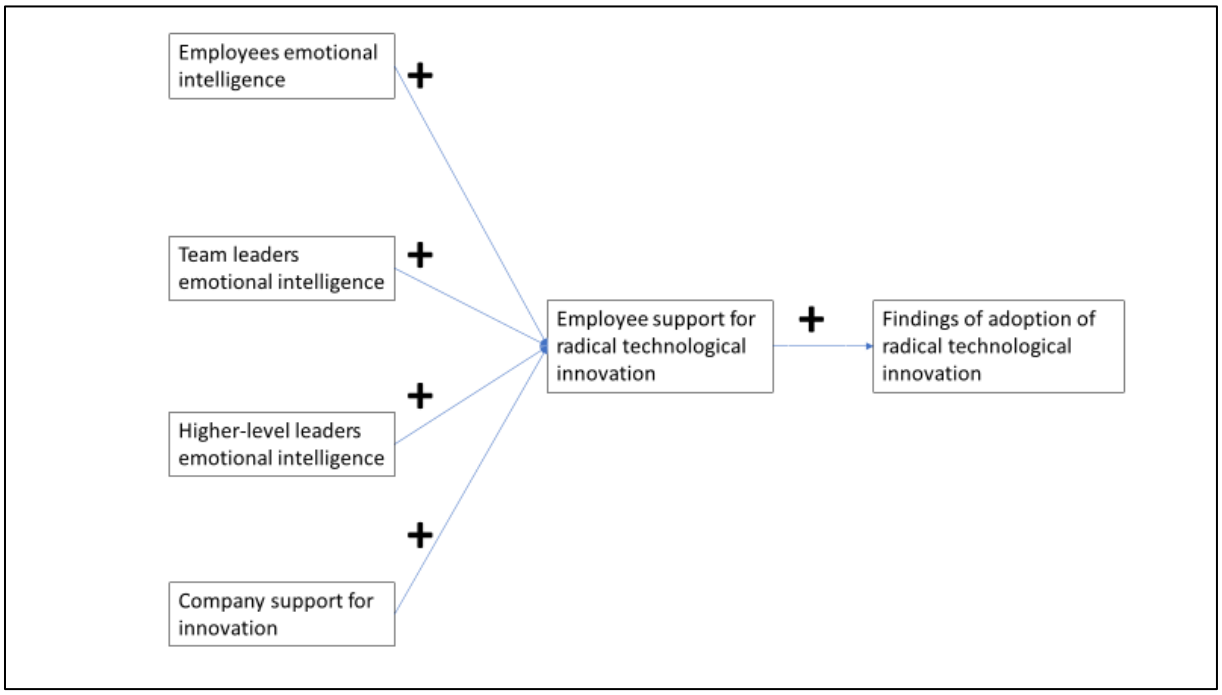

Figure 2. The conceptual model for this study.

Methods

This study investigated the EI of leaders at two hierarchical levels and their employees on the possible effect of employees' support on radical technical innovation projects, such as I4.0 change projects. Two cases were compared which represented two different companies that both work with I4.0 technologies. The data was collected through a mixed-method by combining qualitative and quantitative measures. In particular, multi-source questionnaires and semi-structured interviews were conducted from leaders at different hierarchical levels and their employees (see Appendix 2) (Tyson & Ward, 2004).

For the purpose of this research, the operationalization of companies using or I4.0 technology, meaning that they were actively using, for example, CPS or smart production (Fatorachian & Kazemi, 2018) and other I4.0 topics. Prior to this study, the database of FME was accessed to select companies that meet the requirements of I4.0. The database of FME consisted of approximately 2,200 members, which included technology start-ups, trading corporations, small-medium-sized and small industry, and large industry/multinationals active in the metal, electronics, electrical and plastic sectors. In total, approximately 220,000 employees worked at these member companies. The combined turnover of the FME members accounted for 91 billion and they exported for 49 billion in 2018. FME is the largest employer organisation for the technology industry in the Netherlands with clients accountable for a sixth of the Netherlands total export earnings (Over FME, 2019, May 28). Therefore, FME was a suitable resource to use in this research.

Sample

The two companies are leading organisation and were labelled as an ambassador of I4.0 in the I4.0 database of FME. This meant that they were an example of the most innovative I4.0 companies in the Dutch production environment. Both multinational companies were in the industrial production industry and provided advanced global productivity in the face of high-end autonomation, robotics and joint operations with lean work. They worked with smart intuitive machine operations, multi-system integration, innovative technologies and integrated production lines with flexible productions. Both companies stated that their employee training, guiding, loyalty, and engagement was strongly valued and supported. Their employees knew how to work with smart intelligent machines, who contributed to a high uptime, effectiveness, reliability, ergonomics, and safety. Both

companies had low to medium level labour in the production environment, where in the last couple of years their personnel had become accustomed to numerous changes. Changes in management-, in work ethics and production methods. In total, approximate 700 employees per company were working worldwide, with both companies had approximately 50 years of experience.

In total, fourteen participants were interviewed, and twenty participants were asked to fill in a questionnaire regarding their I4.0 support, organisational support, and EI. The participants consist of high-level leaders, team leaders and employees. The high-level leaders are middle and upper-level managers who guided their employees and had the final responsibility for I4.0 project within their organisation. The team leaders were middle management directly under the supervision of their high-level. The team leaders' scope of control were their employees, who worked directly with the I4.0 technologies.

Sampling

At first, simple random sampling was chosen for this study, with samples out of the Smart industry ambassadors list, created by FME. With a simple random sampling method, one selects respondents in a random way. While using this technique, one randomly selects the respondents from a system. A strength of this technique is that it is relatively simple. A shortcoming is that it is very hard to construct the sampling frame (Peregrine, 2019). Companies were included form the FME Smart Industry Ambassador list if they met the following inclusion criteria: actively working with I4.0 change projects; companies that were listed in the regions North, North-West, and East in The Netherlands. Subsequently, the list contained 120 companies and functioned as the target area for this study. However, several companies were listed in multiple regions, as a result, the total range of unique companies is higher than reality. From those 120 companies, 60 companies were rated as supposable I4.0-ready. This I4.0 readiness evaluation was carried out by experienced consultants from amongst others, FME, who knew these companies and their work on I4.0 professionally.

These advised companies have been approached via e-mail. Of those 60 companies, 20 companies replied with positive reactions towards this study. At the same time, the companies that did not respond, were sent a reminder e-mail after 10 days and were called several times. These reminder emails and phone calls resulted in another 11 companies that were still interested. The phone calls and e-mails led to a total of 12 company visits, and eight promised co-operations via email or telephone. However, despite the great interest of the 12 visited

companies, eight companies were excluded, since this survey only fitted four of the 12 companies after the company visits. This was due to the fact that the companies were not yet, or insufficiently engaged in, actual I4.0 applications. Another reason was that these companies were only recently discovering I4.0 with less than one full time employee. Subsequently, the eight promised co-operated companies opted out for the similar reasons.

A total of four companies were recruited. However, two companies opted out later in the process of this study. This led to two companies, case X and Y, to be studied. Table 1 describes the methodology schematically per case.

Table 1

Methodology schematically

Case X (*N* = 14)	**Variable**	**Employees (*n* = 10)**	**Team leaders (*n* = 2)**	**High-level leaders (*n* = 2)**
Semi-structured interview (*N* = 5)	Radical Technology Adoption I4.0 support EI	3	1	1
Questionnaire (*N* = 9)	EI/ Management EI Technology support Management support. Degree of adoption of I4.0	7	1	1
Case Y (N = *20*)	**Variable**	**Employees (*n* = 10)**	**Team leaders (*n* = 6)**	**High-level leaders (*n* = 4)**
Semi-structured interview (*N* = 9)	Radical Technology Adoption I4.0 support EI	5	2	2
Questionnaire (*N* = 11)	EI/ management EI Technology support Management support. Degree of adoption of I4.0	5	4	2

Note. *N* = total sum of test applicants

Measures

A questionnaire was employed as the quantitative part of this study, whereas interviews were conducted to give input for the qualitative part. To measure the level of adoption in the two companies, this study used the “adoption of I4.0 technologies” measure from Tortorella, Giglio and Van Dun (2018). A seven-point Likert scale was conducted with ‘1’ meaning that the technology is ‘not used’; to ‘7’, meaning that the technology is ‘fully adopted’. The five items are 1) digital Automation without sensors, 2) digital automation with process controls sensors, 3) remote monitoring and control of production, 4) digital automation with sensors for product and operating conditions identification, and 5) integrated engineering systems for product development and product manufacturing (Tortorella, Giglio, & van Dun, 2018). The level of adoption of I4.0 was assessed by all the participants within this research.

This study has adopted the extended Technology Acceptance Model (TAM2) (Venkatesh & Davis, 2000) survey to measure participants acceptance of radical technology innovations such as I4.0. The original TAM demonstrates three important factors in specific phases; the "perceived ease of use" and the "perceived usefulness" in the cognitive response phase, and the “intention to use” in the affective phase. The cognitive response phase reflects on the usability and easy usage of technology. Based on this, the affective response phase reflects on the attitude of the end user when using the product. Ultimately, the behavioural response phase reflects on how an individual actually uses the new technology (see Figure 3).

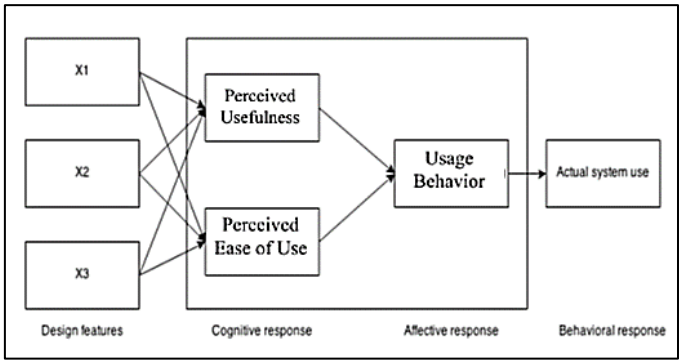

Figure 3. Technology Acceptance Model. Reprinted from: User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, 35(8), 982–1003 (Davis, Bagozzi, & Warshaw, 1989)

By quantifying the data as much as possible, a forecast could be made about the acceptance of the new technology. This study used an extended version of the TAM (see Figure 4), which

was called the extended Technology Acceptance Model 2 (TAM2) (Venkatesh & Davis, 2000).

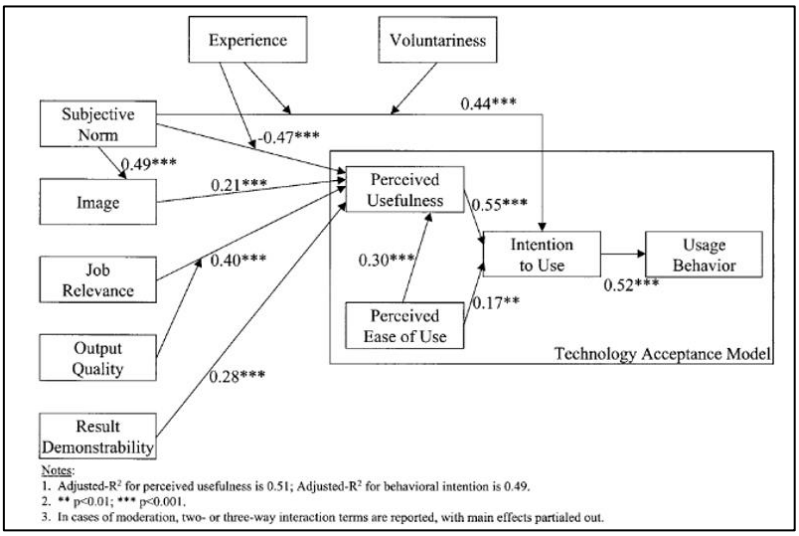

Figure 4. The extend technology acceptance model. Reprinted from*:* A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186-204. (Venkatesh & Davis, 2000)

The TAM2 is constructed with various factors that affect each other. These factors and the joint influences are embodied vividly in Figure 4. The factors Perceived Ease of Use (PEU) and Perceived Usefulness (PU) have the most impact on the factor Intention to Use (IU). Furthermore, the factors subjective norm, image, job relevance, output quality, and result demonstrability have an influence on the PU. However, for this study, only the Subjective norm and Voluntariness were being assessed since only these factors are applicable to the characteristics of the target group in the researched companies. Due to these adjustments, the TAM model has adjusted somewhat for this study, as only the subjective norm and voluntariness were applied (see Figure 5 and Appendix 3).

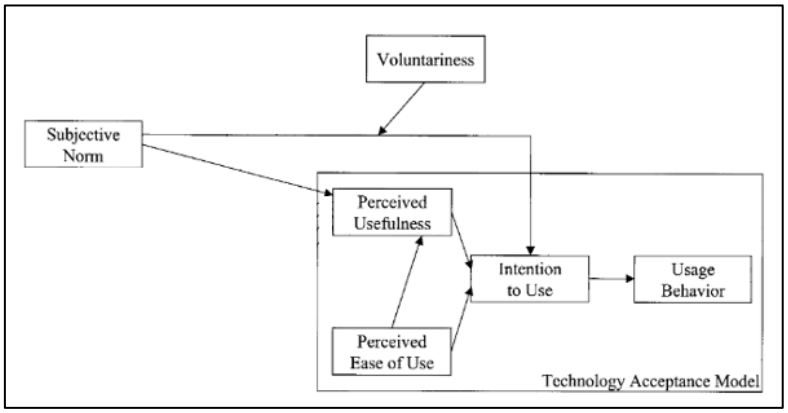

Figure 5. Adjusted TAM2 Model

The survey from the Innovation Support Inventory (Lukes & Stephan, 2017) was conducted to measure the perceived hierarchical and organisational support for innovation. The survey used for this study comes with a seven-point Likert scale ranging from 1 as 'fully agree' to 7 as 'fully disagree' where greater value characterizes more perceived support for innovation from within the organisation and by hierarchical leaders (see Figure 6). The complete survey can be found in Appendix 4.

Innovation Support Inventory	
Managerial support	
My manager motivates me to come to him/her with new ideas	0.738
My manager always financially rewards good ideas	0.546
My manager supports me in implementing good ideas as soon as possible	0.871
My manager is tolerant of mistakes and errors during the implementation of something new	0.542
My manager is able to obtain support for my proposal also outside our department	0.712
Organizational support	
The way of remuneration in our organization motivates employees to suggest new things and procedures	0.775
Our organization has set aside sufficient resources to support the implementation of new ideas	0.796
Our organization provides employees time for putting ideas and innovations into practice	0.609

Figure 6. Innovation support inventory. Reprinted from: Measuring employee innovation: a review of existing scales and the development of the innovative behaviour and innovation support inventories across cultures. *International Journal of Entrepreneurial Behaviour & Research*, 23(1), 136-158. Lukes, M., & Stephan, U. (2017).

The qualitative part of this research was done using semi-structured interviews for measuring the radical technical innovation adoption, innovation support, the EI and acceptance for radical technology innovations such as I4.0 of the participants. The characteristics in identifying the same radical technology innovations topic at the company were examined with the participants before starting the interview, to align understandings and mitigate miscommunication about the topic.

Semi-structured interviews were based on the Critical Incident Technique (CIT), which is an interview method where topics are put on paper for the start of the conversation. The open-ended questions were flexible and allowed the assessor to follow arguments or statements that deviated from the topic guideline (Jamshed, 2014). The interviewee could formulate his or her answers in his/her own words, but could not determine the topic of conversation (Flanagan, 1954). The CIT is an exceptionally adaptable qualitative research method applied to give useful answers in problems or investigations (Kemppainen, 2000). Furthermore, CIT is utilized in various fields such as; production, communications, advertising, and distribution, which makes CIT a suitable method for this study (Butterfield, Maglio, Borgen, & Amundson, 2009). Illustrations of questions were as followed: 1) overall first attitude of the individual toward change is their company, 'What is your first response to change in the company?'; 2) understandings of the broader picture from the I4.0 changes in

the past of this company, ‘What change has the company experienced regarding radical technical changes such as I4.0 applications?’; 3) support of the employee toward the radical technical changes, ‘To what extent do you support the I4.0 change project?’.

In total, eight employees, three team leaders, and three high-level leaders were interviewed. The advantage of doing interviews is that the perception of the individual is the focus, therefore the interviews were held separately from each other, subsequently on the same day to avoid participants correcting, influencing or interrupting each other throughout, beforehand, or after the interview (Irvine, Drew, & Sainsbury, 2013).

To create reliability and validity, this study used a psychometrically sound and practically proven short EI measure which is often used in management and leadership studies (Wong & Law, 2002). There are many EQ tests that aim to measure EI. Examples are the 14-item measure of EI by Carson, Carson and Philips (1997), Goleman's’ ten-item EI measure and Weisingers’ approach (1998), however, they are all without validation evidence (Goleman, 1995; Wesinger, 1998).

Wong and Law’s (2002) measure combines the tests of Mayer, Goleman and many others. The Wong and Law EI test contains 16 items with a seven-point Likert scale, all derived from other EI measurement tests as described above (Wong & Law, 2002). This survey has been successfully tested in a study on the effects of leader and follower EI on performance and attitude executed by Wong and Law in 2002 with reliability estimates (coefficient alphas) respectively .89, .88, .76 and .85 (Wong & Law, 2002) and is, therefore, a suitable survey for this study. The EI survey has four scales: self-emotion appraisal, the use of emotions, regulatory of emotions, and others ‘emotion appraisal. The respondent can choose from a scale of 1 to 7 from for example "1: very unimportant" or "7: very important".

To avoid social desirability bias, this study used a multi-source feedback instrument. The multi-source feedback instrument principle is a method to evaluate the functioning of an individual using multiple assessors in the field of employee assessment and development. This instrument is about generating feedback from several people with different perspectives on the behaviour of the assessed person. The individuals need to have a good view of the daily functioning of the person concerned. This can be colleagues of the same level, but also subordinates or the direct supervisor. By combining the different perceptions of these persons, a complete picture is obtained of the assessed person (Tyson & Ward, 2004). The multi-source feedback was used to describe hierarchical leaders EI form multiple views to get an average mean of their EI.

Data Analysis

The quantitative results from the multi-source feedback were linked to each other and means were displayed. This was done for the employee by analysing their scores on the EI results. The average EI score entered by team leaders and high-level leaders were analysed and added to the average observed EI score that employees entered for their hierarchical leaders. This value was then corrected to calculate a weighted average for the high-level- and team leaders for the multi-source feedback result. The data from the interviews was assessed to measure the perceived employee support towards the I4.0 projects, the employees'- and hierarchical leaders EI and the present adoption of radical technical innovation.

First, the interview data from the audio recordings were transcribed verbatim. Then the coding process started, executed multiple times in the same manner of time (Thomas, 2006), according to the theory and practices of Corbin and Strauss (1990). Preceding the coding procedure, the raw text read several times to get acquainted with the material. In the beginning, the process of open coding started. All the transcripts were read, and the text was divided when applicable within Emotional Intelligence, Radical Technological Innovation, and Support for Radical Technical Innovation. this was also checked by a partner to remove possible errors. The second step was axial coding. All the divided texts were aligned with a code and then put into a category. The last phase was selective coding, where all the categorized codes were appointed to a label. Figure 7 illustrates this qualitative overview for this study (Corbin & Strauss, 1990).

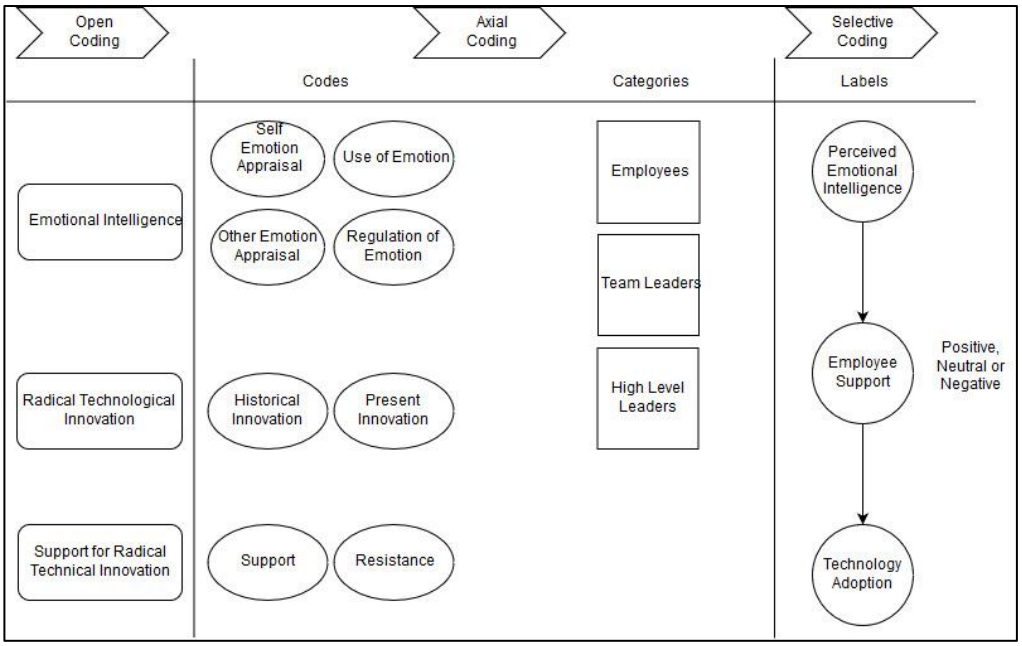

Figure 7. Qualitative overview for this study.

The last phase was to convert observations between the expectations from the theory, the data from the surveys, and interviews. The theory was mostly collected throughout the Web of Science, Scopus and Google Scholar. This provided a reasonable answer to whether and how employees EI correlates with employee support for radical technology acceptance.

The quantitative data was analysed within SPSS 25.0. a correlation matrix and a, while the interviews were analysed throughout the use of Atlas.ti. The signals of the EI of high-level leaders, team leaders and employees and the data derived from the interviews and Innovation Support Measurement survey gave an honest impression on how the EI of leaders and employees affects I4.0 change projects.

Ethical Approval

This study has been ethically approved by the Ethical Comittee (EC) of the University of Twente. Prior to the data collection, the participating companies gave permission to interview their employees to some extent delicate matters, company privacy, and personal opinions. To ensure that the privacy of the participants would not be compromised, the informed consent form has been included prior to the interviews in their native language (see Appendix 5). In this informed consent, their anonymity and privacy were made secure. The participants singed for their anonymous participation, including the permission to be audio-recorded. Correspondingly the data in this study was made anonymous. Therefore, case X and case Y referred to both companies in this study, and participants were subdivided into categories of high-level leaders, team leaders, and employees. The clearance was given by the participants prior to the study to anonymous keep the audio recordings and written survey answers and researcher notes for a period of maximum five years before deleting them. Until deleting the data, the digital and written data will be restored in a secure location at the University of Twente.

Results

A mixed-method design was employed to address the emotional intelligence and support of employees using semi-structured interviews along with a multilevel quantitative analysis with a triangulation sample of employees, team leaders, and employees.

Qualitative Analysis

Semi-structured interviews focused on the EI, support, and adoption of radical technical innovation of employees (n = 8), team leaders (n = 3), and high-level leaders (n = 3). After analysing the outcomes, three inductively developed themes emerged that are illustrated in Table 2.

Emotional intelligence.

This theme demonstrates the EI of employees, team leaders, and high-level leaders in radical technical innovation projects. The largest category is Other Emotion Appraisal (n = 44 demonstrations) with the highest number of demonstrations within the employees' group (n = 25 demonstrations). Other Emotional Appraisal reflects on perceiving other's emotions such as recognizing the emotion of fear or happiness. An employee displayed and described the perceived emotions of co-workers on the implication of an I4.0 innovation: *'[…] Yes well, they recognize that right away, they actually notice that. But everyone is positive about that, so that really affects each other […]'* Furthermore, team leaders and high-level leaders have shown Other Emotion Appraisal (n = 10 and n = 9 respectively). Most team leaders and high-level leaders mentioned their understanding for a possible resistance or fear from employees as smart industry machines took over some job positions. One team leader stated about his understanding of possible resistance or fear from the employees that smart industry machines were taking over the jobs. Another team leader voiced about the emotions of his immediate colleagues and his employees. He expressed that they were visibly happy and enthusiastic that a project did not come to a halt but was taken seriously: '*[…] Yes, positive yes! Yes, everyone thinks that it is only good! Yes, everyone is happy with that, that it is picked up, say, that it is not something that stays silent, but that it is really continued […]*'

Table 2

Inductively Developed Thematic Categories of EI, Support and Radical Technical Innovation Adoption.

Thematic Categories	Employees (*n* = 8)	Team Leaders (*n* = 3)	High-level Leaders (*n* =3)	Total (*N* =14)	Percentage of key theme	Example of quote
Emotional Intelligence						
Others Emotion Appraisal	25	10	9	44	35.2	*'So that makes us very happy, just like the boys in the workplace'*
Self-Emotion Appraisal	22	1	5	28	22.4	*'Sometimes that frustrates. Then you think: go ahead with the change'*
Regulation of Emotion	16	6	5	27	21.6	*'Sometimes I find that a difficult thing, but then you just have to let go'*
Use of Emotion	14	5	7	26	20.8	*'Because I like it so much, I also try to pass it on to our colleagues'*
Support						
Backing	45	12	9	66	64.1	*'Yes, I became enthusiastic! I am excited about innovations like that, I think it is great! Nice! Go further, and that the company offers those opportunities. It's fun!'*
Resistance	9	6	6	21	35.9	*'I don't like the change. I'd rather it stays the same.'*
Radical Technical Innovation Adoption						
Present	10	5	10	25	64.1	*'The HoloLens is certainly a part of the smart industry or the embrace or principles of the smart industry and how that is made known within the organisation'*
Historical	9	1	4	14	35.9	*'then I always feel that we want to go back very quickly to the old part that has been functioning for 20 years.*

Note. The table shows the number of displayed categories within the key themes.

Employees provided many examples of displaying EI, such as Self Emotion Appraisal (*n* = 22), Regulation of Emotion (*n* = 16), and Use of Emotion (*n* = 14). Most employees mentioned their positive thinking towards radical technical innovation projects, others suggested the fruitful positive thinking they had to do. One employee told himself and colleagues that they had to cooperate with the radical technical innovation change projects, regulating their emotion for the higher purpose as it would benefit the company and therefore themselves. Another employee mentioned his support and his own emotion about the I4.0

project in their company: *'[…] Oh well I think I'm pretty happy. I am also pleased that I am allowed to work with these beautiful new techniques […]'*

Some high-level leaders spoke about their own enthusiasm for technical innovations and about a large amount of energy they needed to convince employees: *'[…] But only the thought of applying the [smart industry innovation] also made me enthusiastic. But it required more persuasiveness to make the others equally enthusiastic about it'.* Another high-level leader spoke about his recognition of emotion of resistance in the lower regions of the company. He mentioned how employees showed signs of resistance when the management included them about the implication of smart industry machines: *'[…] There was quite a bit of resistance immediately upon reporting that we were going to try something with smart industry machines'*

Support.

This theme demonstrates the positive backing or resistance of employees, team leaders, and high-level leaders on radical technical innovation projects. The largest category is the Backing (n = 66 demonstrations) with the highest number of demonstrations within the employees' group (n = 45 demonstrations). The Backing category reflects on the displayed positive appreciation of the radical technical innovation, such as actively cooperating or contributing to the way in which the innovation can be used or even improved. Most employees had a positive and even '*fun'* feeling towards their radical technical innovations and were backing the process and implementation. An employee described the positive support for radical technical innovations in the category Backing as being fun and future potential: *'[…] Yes, nice. Yes, I really like that! You also see the potential and it really is I4.0. It's fun […]'.* Another employee described that he was glad to be a part of that future: *'[…] Like the one from [smart industry innovation), I wanted to be there. I like that, that's the future, and I find it interesting myself.'* Furthermore, team leaders and high-level leaders showed signs of positive support for radical technical innovations (n = 12 and n = 9 respectively). A team leader described his positive support regarding radical technical innovation as:

> *'[…] Yes, very much [support]! Do it! Because I like that kind of development. Especially the [Radical Technical Innovation]. I am quite proud to have that thing as the construction company. So yes, I do encourage that, both towards the boys and internally here as well.'*

Pleural high-level leaders mentioned *'good feelings', ´*positive *gut feelings*' when describing their emotions regarding the radical technical innovations: '[…] *Yes. 'I am confident that this path is successful and that it is important'*. A high-level leader pronounced his and his subordinate's opinion and a proud feeling on the new technology as:

> *'[…] Employees are also proud of the [Radical Technical Innovation]. "We developed that as Case X." In the end, it is still a Case X machine and we say that we are proud and that we have the [Radical Technical Innovation]. And in principle, every employee does that.'*

The second category in Support describes negative emotions concerning the radical technical innovation within the company. Resistance has the largest demonstration within the employees (n = 9) with a total sum of demonstrations combined with team leaders and high-level leaders (n = 21). Most employees complained about the time frame in which the project took place. One employee described the implication of radical technical innovations as time-consuming and slow. Another employee agreed that the company needed the improvements, still, there is still a long way to go: *'[…] I support him [the innovation] to a certain extent'* and *'[…] So I understand this is definitely the future. But there is still a long way to go.'*

Some team leaders thought differently about innovations. Team leaders thought that innovation changes were too slow, while some did not like any change. Likewise, a high-level leader noticed routine-based changes in the company, while another mentioned how the organisation slowly moved from resistance towards change in support for innovations. A high-level leader clarified that the opinion about the change in his company always followed the same route: '*Change? yes, please. And who first? Then you point to the other'*. Another high-level leader explained that his organisation was slowly moving from resistance towards change in support for radical technical innovations. He indicated that they had been working on this process for two years and that it was slowly beginning to take shape, although the resistance was still present:

> *'[…] And I think that that is typical because everyone is open to change. "If it does not happen to me". And it is. You notice that very strongly in the beginning. And then it starts to change slowly from "it's not so bad". But then there is a 2-year process in advance, so that shows something.'*

Radical technical innovation adoption.

This theme demonstrates the adoption of radical technical innovations, such as I4.0 technologies, perceived by employees, team leaders, and high-level leaders. The largest category is the Present (n = 25 demonstrations) with the highest number of demonstrations within the employees and high-level leaders' group (n = 10 demonstrations). The Present category reflects on the displayed current practice of perceived radical technology innovations within the company, for example, AR or CPS as I4.0 applications. One employee described the perceived adoption of current radical technical innovations as an example of smart industry. One more employee explained how the machine autonomous could think and make decisions based on own real-time gathered data:

> *'[…] The smart machines ... yes, the [radical technology innovation] is of course one. Yes, that is, of course, an example of a machine that thinks things out itself. From how I determine how my weld will be, which place will be first, through which angle do I place it ... I think that is the best example of its smart industry innovation, isn't it?'*

A high-level leader explained the digitization of supporting working environment about the implication of their new technology as how it simplified identification and created new possibilities to experience future projects first-first hand: *'[…] virtual and augmented reality glasses around our [future] building processes, we can already walk around without a building, the idea of the building arises.'*

The second category in Radical Technical Innovation Adoption is describing historical experiences concerning the radical technical innovation adoptions within the company. Historical examples were most mentioned by the employees (n = 9) with a total sum of demonstrations combined with team leaders and high-level leaders of n =14. An employee described the implication of historical technology as 'simple and easy'. The machines had two simple option: *'on or off*'. Another employee elucidated that when current radical technology innovations are not working perfectly, they often feel the need to go back the ways of doing business and using technology: *'[…] then I always feel that we want to go back very quickly to the old part that has been functioning for 20 years.'*

A high-level leader expressed about how the new technology adoption is changing the old ways. Compared to old techniques, now they needed fewer people to be on the job or even in the same country. He defined that the current state of affairs created no place for the older

technology and its operators: *'[…] This is now also delivered automatically with new new-build installations. So that means that the driver we used to have in the field is actually no longer needed.'*

Quantitative Analysis

The results of the surveys were analysed using a reliability analysis to measure the Cronbach alpha. Correlation analyses, independent sample T-tests, and regression analyses were conducted to study the phenomena. Further analyses were not fully possible, due to too much resistance, the unwillingness and inability of participants to complete all the questionnaires and the lack of a sufficient sample. Table 3 describes descriptive statistics.

Table 3

Descriptive Statistics.

Statistics	Item	Frequency	Percent	Valid Percent	Cumulative Percent	Mean	Std. Deviation
Gender						1.00	.000
Valid	Male	17	85.0	100.0	100.0		
	Female	0	0.0	0.0			
Missing	System	3	15.0				
Total		20	100.0				
Age						3.41	1.278
Valid	16-20	2	10.0	11.8	11.8		
	31-40	9	45.0	52.9	64.7		
	41-50	1	5.0	5.9	70.6		
	51-67	5	25.0	29.4	100.0		
	Total	17	85.0	100.0			
Missing	System	3	15.0				
Total		20	100.0				
Position						1.61	.778
Valid	Employee	10	50.0	55.6	55.6		
	Team leader	5	25.0	27.8	83.3		
	High-level leader	3	15.0	16.7	100.0		
	Total	18	90.0	100.0			
Missing	System	2	10.0				
Total		20	100.0				
Years working in current position						2.12	1.317
Valid	0-3	7	35.0	41.2	41.2		
	4-8	5	25.0	29.4	70.6		
	9-12	3	15.0	17.6	88.2		
	>19	2	10.0	11.8	100.0		
	Total	17	85.0	100.0			
Missing	System	3	15.0				
Total		20	100.0				
Years of work with current organisation						2.35	1.272
Valid	0-3	5	25.0	29.4	29.4		
	4-8	5	25.0	29.4	58.8		
	9-12	5	25.0	29.4	88.2		
	>19	2	10.0	11.8	100.0		
	Total	17	85.0	100.0			
Missing	System	3	15.0				
Total		20	100.0				
Highest level of education						2.59	.712
Valid	Vmbo	1	5.0	5.9	5.9		
	Mbo	6	30.0	35.3	41.2		
	Hbo	9	45.0	52.9	94.1		
	Wo	1	5.0	5.9	100.0		
	Total	17	85.0	100.0			
Missing	System	3	15.0				
Total		20	100.0				

The descriptive statistics clearly show that it covers a homogeneous male population in terms of gender in this sample. It shows that of the 20 participants, 3 people did not reveal the demographic information. Most participants are between 31 and 40 years old and classify themselves in the employee category. 0-3 years in the current position is the category that occurs the most, and only 2 participants work for the same company for more than 19 years. 52.9 percent of the participants have a bachelor's degree, and only 5.9 percent have a high school or a master's degree.

To check the reliability of the different scales, a reliability analysis has been conducted (see Table 4). Although practically all items had a positive result, namely <.7 with a max of .941 for the items in perceived innovation support by the manager. Since there is no consecrated level of unacceptable or acceptable alpha, in some cases measurement with risky low alpha can still be used as satisfactory (Schmitt, 1996) in this case, Table 4 shows that the reliability, for all the scales, after correcting, can be qualified as "good". The "Self emotion appraisal" and “Leader other emotion appraisal” scales can be qualified as “sufficient”. There are no scales qualified as “not reliable”.

Table 4 illustrations that the lowest observed mean, company innovation support with the scale innovation support organisation, has a large standard deviation of 4,3684 and 1,45252 respectively. This scale refers to how the participants perceive the support they acquire by the facilities arranged by the company. However, Table 4 shows the largest mean within the construct employee support for Technical radical innovation with the scale intention to use (5,8750). This refers to how much the participants are willing to actively work with the radical technical innovation.

Table 4

Reliability overview.

Construct	Scale	N items	Cronbach's α	Mean	Std. deviation
Adoption of technical innovation	Innovation application (IA)	4 (5)	.851 (.501)	5.8000	1.12361
Employees support for radical technical innovation	Intention to use (ITU)	2	.871	5.8750	.84097
	Perceived usefulness (PU)	4	.939	5.3125	1.33740
	Ease of use (EOU)	4	.839	5.2250	.95937
	Subjective norm (SN)	2	.850	4.4500	1.45909
	Voluntariness (V)	2 (3)	.746 (.662)	4.6250	1.93904
	Total mean			5.0975	1.307174
Company Innovation support	Perceived innovation support management (ISM)	5	.941	5.0421	1.50787
	Perceived innovation support organisation (ISO)	2	.771	4.3684	1.45252
	Total mean			4.70525	1.480195
Leaders emotional intelligence	Leader self emotion appraisal (LPSEA)	4	.864	5.4125	.68956
	Leader other emotion appraisal (LPOEA)	4	.650	4.8500	.80459
	Leader use of emotion (LPUOE)	4	.889	5.4000	.89736
	Leader regulation of emotion (LPROE)	4	.905	5.5125	.69051
	total	16		5.29375	0.770505
Emotional intelligence	Self emotion appraisal (SEA)	3 (4)	.623 (.458)	5.7333	.78435
	Others emotion appraisal (OEA)	4	.780	5.0750	1.06097
	Use of emotion (UOE)	4	.762	5.5625	.70185
	Regulation of emotion (ROE)	4	.868	5.3158	.92362
	Total mean			5.42165	0.867698

Performing a reliability analyses on the items contributing to Self emotion appraisal, a Cronbach's alpha of 0.485 is discovered. Removing item 1 in Self emotion appraisal increases the Cronbach's alpha to 0.623, therefore item 1 has been removed. However, the alpha is still not .7, but with the erase of item SEA the Cronbach's alpha increases with a rise of >.5, approaches .7, and is therefore considered suitable. Performing a reliability analysis on the items contributing to radical technology innovation project Voluntariness, a Cronbach's alpha of 0.662 is discovered. Deleting item 15 increases the Cronbach's alpha to 0.746, therefore item 15 has been removed. The influence of item 15 might be due to misinterpretation of the double negative in the question. A reliability analyses of the items contributing to Innovation Adoption, a Cronbach's alpha of 0.501 is discovered. This is possible because the participants found it difficult to qualify question 1, because the overall knowledge of the participants may

not have been sufficient. Deleting item 1 increases the Cronbach's alpha to 0.851, therefore item 1 has been removed.

Table 5

Correlation Matrix.

		1	2	3	4	5	6
1. Radical technology adoption	Pearson Correlation	1					
2. Employee support for radical tech innovation	Pearson Correlation	0.396	1				
3. Company innovation support	Pearson Correlation	-0.609	0.007	1			
4. High-level leader EI	Pearson Correlation	-0.738	0.159	-0.208	1		
5. Team leader EI	Pearson Correlation	.[a]	-0.579	0.810***	.[a]	1	
6. Employee EI	Pearson Correlation	-0.775	0.219	-0.145	0.989***	.998*	1

*. P < 0.01 (2-tailed).
***. P < 0.10 (2-tailed)
a. Cannot be computed because at least one of the variables is constant.

By performing a correlation analysis, see Table 5, it was examined whether the supposed coherence was present. A higher correlation coefficient means a stronger relationship between the two variables. The first thing to notice is that there is a strong positive significant correlation between employee EI and team leader EI. Another positive significant correlation has been observed, namely, the relation between the employee EI and high-level leaders EI. One more significant positive relation is detected between team leader EI and company innovation support. However, the latter two are marginally significant. The lack of significant meaningful data may be due to the very small sample in this study.

Within cases: case X.

Interesting results show in Table 6, that the maximum level of EI of the employees outmatches the maximum corrected EI of the team leaders and high-level leaders, however, from Table 6 it can be concluded that the team leader and the high-level headers score equal higher on EI (5.5198) than the employees (5.2778). Moreover, there is no evidence that the EI of the employees differs significantly from the EI of the team leaders or high-level leaders in case X. Moreover, the standard deviations of the tests subject could only be conducted for the employees, due to small the small *n* of capable participants in case X.

Table 6

Descriptives Case X.

Mean corrected EI (for leaders corrected with perceived EI by employees per case)								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Employee	8	5.2778	.59696	.24371	4.6513	5.9043	4.44	6.17
Team Leader	1	5.5198	.	.	.	.	5.52	5.52
High-level leader	1	5.5198	.	.	.	.	5.52	5.52
Total	10	5.3383	.51682	.18272	4.9062	5.7704	4.44	6.17

Table 7.

ANOVA Case X.

Mean corrected EI (for leaders corrected with perceived EI by employees per case)					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.088	2	.044	.123	.887
Within Groups	1.782	5	.356		
Total		1.870	7		

Within cases: case Y.

From the table it can be concluded that the high-level leaders and the employees score 5.4563, 5.4167 respectively on their EI followed up by the team leaders (5.3365). Moreover, there is no evidence that the EI of the employees differs significantly from the EI of the team leaders or high-level leaders. However, the table shows that the maximum level of EI of the employees outmatches the maximum EI of the team leaders and high-level leaders. Moreover, the standard deviations of the high-level leaders show a very small difference compared to the team leaders, but with a larger increase of standard deviation on employees, see Table 8.

Table 8.

Descriptives Case Y.

Mean corrected EI (for leaders corrected with perceived EI by employees per case)								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Employee	4	5.4167	.38976	.19488	4.7965	6.0369	5.06	5.88
Team Leider	4	5.3365	.10859	.05429	5.1637	5.5093	5.20	5.46
High-level Leader	2	5.4563	.09575	.06771	4.5960	6.3166	5.39	5.52
Total	10	5.3925	.24113	.07625	5.2200	5.5650	5.06	5.88

Table 9.

Test of Homogeneity of Variances Case Y.

Mean corrected EI (for leaders corrected with perceived EI by employees per case)			
Levene Statistic	df1	df2	Sig.
10.451	2	7	.008

The Levene's test is used to test the assumption of equal (homogeneous) variances. In this case, the Levene's test is significant (p = .008), thereby violating the assumption of equal variances, see table 9.

Table 10.

ANOVA Case Y.

Mean corrected EI (for leaders corrected with perceived EI by employees per case)					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.023	2	.012	.161	.854
Within Groups	.500	7	.071		
Total	.523	9			

Between cases.

The tables 11 and 12 show no significant difference between the mean EI for both their high-level leaders of each case. However, it clearly shows that the mean EI of case X is slightly higher perceived.

Table 11.

Between cases: Group Statistics High-level leaders.

	1= case X, 2= case Y	N	Mean	Std. Deviation	Std. Error Mean
mean (EI)	Case X	1	5.5198	.	.
	Case Y	2	5.4563	.09575	.06771

Table 12.

Between cases X and Y: Independent Samples Test.

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
mean EI	Equal variances assumed	.	.	.542	1	.684	.06354	.11727	-1.42657	1.55365
	Equal variances not assumed			.	.	.	.06354	.	.	.

Table 13.

Between cases X and Y: Group Statistics team leaders.

	1= case X, 2= case Y	N	Mean	Std. Deviation	Std. Error Mean
mean EI	Case X	1	5.5198	.	.
	Case Y	4	5.3365	.10859	.05429

Table 14.

Between cases X and Y: Independent Samples Test team leaders.

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2 tailed)	Mean Difference	Std. Error Difference	Lower	Upper
mean EI	Equal variances assumed	.	.	1.51	3	.228	.18333	.12140	-.20303	.56969
	Equal variances not assumed			.	.	.	.18333	.	.	.

The tables 13 and 14 show no significant difference between the mean EI for both their team leaders of each case. However, it clearly shows that the mean EI of team leaders in case X is perceived slightly higher.

Table 15.

Between cases X and Y: Group Statistics Employees.

	1= case X, 2= case Y	N	Mean	Std. Deviation	Std. Error Mean
mean EI	Case X	6	5.2778	.59696	.24371
	Case Y	4	5.4167	.38976	.19488

Table 16.

Between cases X and Y: Independent Samples Test Employees.

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
EI	Equal variances assumed	.746	.413	-.407	8	.695	-.13889	.34138	-.92611	.64833
	Equal variances not assumed			-.445	7.992	.668	-.13889	.31204	-.85859	.58081

Tables 15 and 16 show no significant difference between the mean EI for both employees of each case. However, it clearly shows that the mean EI of employees in case Y is slightly higher perceived than in case X (5.4167; 5.2778) with a lower std. Deviation.

Regression analysis.

To measure whether the EI of employees, team leaders, high-level leaders, and the mean Company Support as independent variables influence the dependent variable mean Employee Support for radical technological innovations, a regression analysis was performed (Table 17). The 2 factors have significant support for rad-tech innovation. The R is lower than 0.7, therefore the model has no predictive value.

Table 17.

Regression analysis.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.281a	.079	-.030	.87120

a. Predictors: (Constant), mean company innovation support, mean corrected EI (for leaders corrected with perceived EI by employees per company)

Table 18.

ANOVA.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.104	2	.552	.728	.498b
	Residual	12.903	17	.759		
	Total	14.007	19			

a Dependent Variable: mean of employee support radical tech innovation

b Predictors: (Constant), mean company innovation support, mean corrected EI (for leaders corrected with perceived EI by employees per company)

Table 19.

Coefficients.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.262	3.248		.389	.702		
	mean corrected EI (for leaders corrected with perceived EI by employees per company)	.667	.553	.290	1.206	.244	.935	1.069
	mean company innovation support	.053	.157	.081	.337	.741	.935	1.069

a Dependent Variable: mean of employee support radical tech innovation

Table 20.

Diagnostics.

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	mean corrected EI (for leaders corrected with perceived EI by employees per company)	mean company innovation support
1	1	2.947	1.000	.00	.00	.01
	2	.051	7.588	.01	.02	.85
	3	.002	38.680	.99	.98	.14

a Dependent Variable: mean of employee support radical tech innovation

Results Overview

Overall, the quantitative statistics show that case Y has the highest degree of EI with an average of 5.4. This is slightly higher than in case X (5.3). The employees of case Y score an average EI of 5.4, compared to the employees of case X (5.3). However, the team leaders and high-level leaders of case X both score an average EI of 5.5, compared to the average EI of team leaders and high-level leaders of case Y (5.3 and 5.5 respectively).

The sample of the individual cases separated were too small to make a significant or valuable contribution to this study, however, the characteristics and statistics of the cases were alike, therefore the following values are described as an overall sample. Each test was weighted on a seven-point Likert scale. The adoption of technological innovations has a high average of 5.8. The total mean of employee support for radical innovation is 5.1, while the average mean of company innovation support scores on average 4.8. The EI of employees scores on average lower than that of management, namely 5.35 and 5.45 respectively.

The quantitative statistics overall show data that matches the qualitative outcomes. The extent of the adoption of radical technical innovations is shown in the Present category in data from the interviews. This data shows that no less than 64 percent of radical technical innovations speak of current implementations of I4.0 projects. In fact, the quantitative data compliments this with a larger average value of 5.8, which amounts to 83 percent of current I4.0 adoption.

The results from the interviews indicate that employee support is no less than twice as high as the resistance, with 66 displays positive opinions versus 21 negative opinions regarding the support of radical technical changes. This amounts to 76 percent of the employees who were supportive versus 24 percent against the changes. The quantitative statistics give practically the same to employee support for radical technical changes, namely 73 percent.

A high degree of EI was displayed, no less than 128 times among 14 participants during the interviews. The number of times EI observed is not a measurement, but gives an indication of EI. The fact that they can degenerate into these emotions demonstrates a high degree of EI among the participants. This is complemented by the average high values EI from the quantitative data. Average EI findings are that employees score 5.35 out of 7, which is 76 percent; team leaders score an average of 5.40 out of 7, which is 77 percent; and hierarchical leaders score 5.50 out of 7 which is 79 percent EI. Figure 8 illustrates the significant positive relation found in the quantitative section of the study, marked with an asterisk (+* or +***). Positive relations found in the qualitative part of this study are marked with a '+' (see Figure 8).

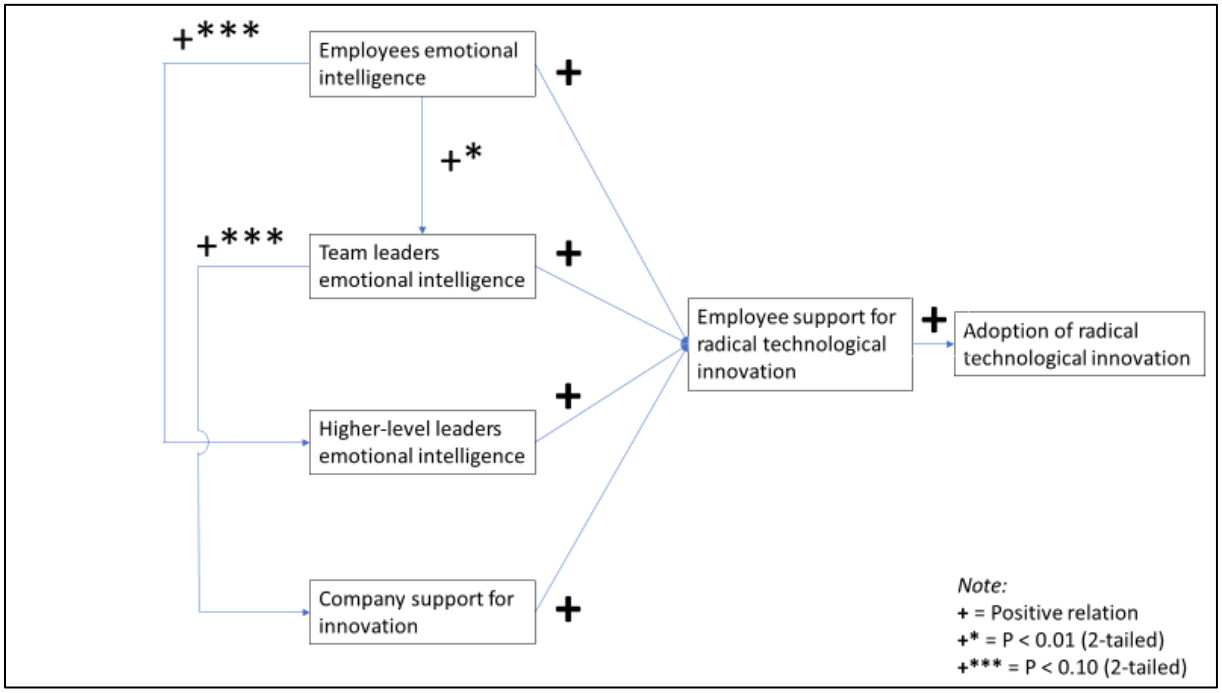

Figure 8. Findings overview.

Discussion

With the increasing announcements of I4.0, this study has attempted to investigate the effects of emotional intelligence on the support of radial technical changes such as I4.0 among employees. Concentrating solitary on technology is not sufficient for successful I4.0 adoption, adequate theoretical contribution supports this (Vos et al., 2017). Therefore, this study measured the EI of high-level leaders, team leaders and employees. In addition, support for innovation from within the organisation was investigated and the support from employees for these change projects was examined. Furthermore, the degree of adoption of radical technical innovations was examined. To give substance to these radical technical changes, this study identified change processes that fit into the I4.0 category, such as CPS and IoT. A mixed-method, multi-level, explorative field study was conducted within two high-tech multinational production companies to answer the following research question:
"*How do top leaders, department leaders, and employees own emotional intelligence affect employees support for radical technological innovation projects, and how does this relate to technology adoption*?"

Overall, it is clear that case X and Y, have similar characteristics. Their company size, characteristic of employees and hierarchical leaders, work region and type of industry is comparable. As a result, it was decided in this study to take all further data together, thus making the sample larger. This allows a correlation to be diagnosed with greater certainty, aiding for a better scientific contribution.

This study found an overall high level of EI among all the participants. High-level leaders scored the highest on EI, then team leaders, followed by employees. This was established by the fact that the participants scored high on EI and were able to express themselves verbally with arguments; they could perceive, recognize, and regulate their own emotions and the emotions of others with a high degree of empathy. Previous studies found similar findings on the characteristics of participants who had a high EI, and how they related to social relations and interactions (Bar-On, 2002; Duffy, Gordon, Whelan, Cole-Kelly, & Frankel, 2004; Goleman & Boyatzis, 2017; Thorndike, 1920). High EI could possibly facilitate communication and relationships in every (change management) project. Therefore, the overall high measured EI is likely to benefit social interactions and can act as a first step to reduce resistance to change.

This study indicates that there are significant positive relations between the EI of employees and team leaders, and between the EI of employees and high-level leaders. This relates to the overall high EI findings. This is possibly due to a logical response, called a cascading effect, or tree events. During this cascading effect, team leaders, or employees in lower levels of the company, display and mimic similar positive behaviour of their high-level leaders (Liu, Liao, & Loi, 2012). Another study describes how, due to this cascading effect, employees' ethical behaviour is triggered by demonstrated ethical behaviour of their supervisors (D. M. Mayer, Kuenzi, Greenbaum, Bardes, & Salvador, 2009). The high-level leaders score high on EI, and according to the cascading theory, this reflects on the team leaders, who on their turn reflect on their employees.

EI, or perhaps the measurement of EI, can only be influenced to a certain extent (Austin, Saklofske, & Egan, 2005). Consequently, a certain variance can always be expected. Although, since EI is a personality score; why is it so contextually influenced? It is therefore somewhat unusual that this has apparently been observed so little. Perhaps this is because the findings in this study have only been explained from the context; not from the personal characteristics. A possible explanation could lie in the ASA framework (Attraction Selection Attrition). The ASA framework explains that organisations ultimately become more homogeneous in terms of "fit" of people, in relation to organisational values and cultures (Schneider, Smith, & Paul, 2001). Since the participants on average score high on EI, this may well be the case; it explains the findings in a more person-centred way.

An alternative theory that may explain the high level of EI measured in both cases is the emotional contagion theory. Emotional contagion theory explains why persons or groups behaviour or emotions trigger similar emotions and behaviours within persons or groups that are in a close relationship with the first person or group (Schoenewolf, 1990). Another study on emotional contagion explains that the EI and the associated actions of team leaders cultivate the EI and actions of the employees (Tsaur & Ku, 2019). In this study, the employee EI correlates to a significantly higher degree with the EI of the team leaders, than the marginal significant correlation with the EI of the high-level leaders. This might be due to the fact that the high-level leaders are hierarchically further away from the employees and they will probably have lesser contact with each other. Team leaders are hierarchically closer to the employees than high-level leaders, and therefore have a closer relationship with each other, which corresponds to the theory of emotional contagion.

Similarly, social identity theory describes the phenomenon of social identification, where a person adopts the identity of the group and imitates to the standards of that group.

Social behaviour, vocabulary, and emotional significance are bound to that group, which may relate to similar EI scores and expression (Stets & Burke, 2000). The results in this study show similar results, considering the high EI scores of the high-level leaders, team leaders, and employees in both cases.

In this study, participants with high EI experience support to changes when interacting with people with similar high EI. Interestingly, most team leaders and high-level leaders started working from lower hierarchical layers as employees. This fact possibly influences their empathy for their employees, since hierarchical leaders know what their employees go through in daily work and during innovation or change projects. Moreover, it is striking that the employees perceive high team spirit and positive relations within the organisation. High-leaders and team leaders confirm this sense of team spirit. This team spirit can have a positive influence on the relationships between employees and their managers. Several other studies suggest equivalent discoveries (Duffy et al., 2004; Laker & Powell, 2011). Because of these positive relationships, employees are more likely to trust the management to make decisions for the benefit of employees and the company. This trust in management creates support with the employees about the decisions made by their managers, regarding radical technical changes.

The majority of employees display very high support for the radical technical innovations. Employees display enthusiasm and are eager to work with I4.0 projects. Furthermore, they express to be proud of using I4.0 technical innovations. However, organisations that educate their employees inadequate about radical technical changes, stand in the way of how employees support and handle such changes (Ritala, Husted, Olander, & Michailova, 2018). Both cases displayed active concerns about employee involvement. Proactive measures were taken to keep employees informed, involved and motivated.

The majority of employees experience above-average innovation support from the company. However, daily support from the facilitating organisation is perceived as insufficient. This is due to the high workload, or time pressure imposed by the organisation to gain competitive advancement. Employees often return to the old procedures and techniques to continue their work, when smart applications seem to fail. Studies found that organisations that focus solely on technology adoption, without proper guidance of hierarchical leaders, fail to establish employee support when tight operational practices determine otherwise (Hayes, 2014; Tortorella et al., 2018). In turn, this could undesirably affect the adoption and implementation of innovations. Interestingly, several studies reported a positive correlation of perceived organisational support and motivated employees acting on their innovative

behaviour (Eisenberger, Fasolo, & Davis-LaMastro, 1990; Kahn, 2018). Likewise, the finding in this study show that management support is experienced as highly motivating by employees.

On average, a high adoption of radical technical innovation is identified from the perspective of all participants. Most participants experience and recognize that they work in a high-tech environment and are aware that they occupy an exceptional position in their sector. For this reason, both companies are labelled as smart industry ambassadors by FME. However, their perception of a high degree of I4.0 adoption may be influenced by the environment. This may be due to the further relatively low technical environment, mainly I3.0 or less, within equivalent organisations in the industry.

Concluding, the findings show that when employees, team leaders, and high-level leaders score high on EI, and when management and organisational support is high, this relates to a high radical technical innovation support among employees. With regards to innovations, this means that employees and hierarchical members are willing to change, implement, and adopt radical technical innovations in their direct working environment. One can suggest that this could be beneficial for change of success in organisations, when considering radical technologically innovative I4.0 change projects.

Strengths, Limitations, and Future Research

This is the first study that seeks to find relations between EI, employee support and technology adoption. Previous studies have investigated the relationship of EI with job performance and attitude (Wong & Law, 2002), employees' creativity and job-related motivators (Wong & Ladkin, 2008), correlations between social intelligence and human relationships (Thorndike, 1920), and interpersonal and intrapersonal intelligence (Gardner, 1993). Therefore, this study is unique because of the mixed-method design and its triangulation of employees, team leaders, and high-level leaders. Questionnaires and interviews were used to gain insight into the level of EI, support, and adoption of technical innovations through the lens of different hierarchical members of organisations.

The interviews and surveys were practiced with experienced consultants working at FME and experts from similar companies with a broad knowledge of the field and organisations working within these radical technologically innovative environments and I4.0. Interestingly, during the interviews, some issues could be related to each other. For example, some leaders found that they were actually very supportive of the technical changes, but that they could not explain with examples of how they made this noticeable to the employees. This aspect made the leaders think about the discrepancy between their leadership example behaviour and what the employees might experience regarding leader support for innovations.

The Netherlands is called a leader of I4.0. This means that its I4.0 infrastructure and Big Data maturity simultaneously show a more than substantial average compared to the rest of Europe (Castelo-Branco, Cruz-Jesus, & Oliveira, 2019). Therefore, the timing of this study aligns with the present process of I4.0 innovations that many Dutch industrial companies are currently working through, and may aid in keeping that I4.0 leadership position in Europe. Throughout the study, although many companies could not apply, there was a great enthusiasm from CEO's and other hierarchical leaders, when spoken to regarding the study on EI and its relation to I4.0 adoption.

This study likewise had some limitations. The small sample (n = 20) for the surveys and the interviews (n = 14) is not representative for all employees, leaders and high-level leaders who are part of radical technical innovations in I4.0 in the Netherlands. However, this study was employed in two types of high technology organisations and the results were similar. Thus, one could refer to the results of this study when related to other high technology companies who are in a comparable radical technological change process.

In addition, the sample for the surveys was only useful to solidify the EI values. Due to the small sample, the further static outcomes were not significant to make correlations

which is a direct consequence of the acquired sample size. This is clearly visible in the run-up to this study since only a few companies were working on radical technical changes in I4.0 in the Netherlands. Of these companies that really did fit into the target group, most were busy innovating with just a handful of people. Additional companies wanted to be included in this study, however, when they understood that they already needed to actively work with I.4.0 projects, all withdrew except for two. Most companies recognized the importance of this study and were very interested in the results. However, in contrast of what some studies found regarding the Netherlands being ahead of I4.0 in Europe (Castelo-Branco et al., 2019; Naudé, Surdej, & Cameron, 2019), investigated companies were not yet ready for such a study. One could suggest that the FME smart industry ambassador list is a correct display of smart industry-enthusiast organisations in the Netherlands, regarding I4.0 active organisations; but not a list of I4.0 readiness organisations.

The quantitative part of this study creates possibilities to generalize the findings. The number of EI displayed during the interviews gives an indication of EI. It is not a measurement, nevertheless, it is striking that participants started to talk about emotions spontaneously and chooses certain words to express his or her emotions and describe the emotions of others. The fact that the participants display EI already gives an impression of the presence of EI in people. Another limitation is that the EI level is not an exact measurement, nevertheless, it is a useful proxy.

For future studies, a mixed-method, larger scale hypotheses testing is suggested to determine the relation of EI on employee support. This study intended to determine if there was a correlation between EI on three hierarchical levels and the support of employees regarding radical technical innovations and how this would relate with the adoption of I4.0 projects. The findings indicate that there is a relation between the support for radical technical innovation and EI. However, if this study would have had a larger sample for the quantitative part, the results would possibly aid on a larger scale with more practical insights for companies in this field of interest.

Moreover, due to the low sample size, some tests could not be fully conducted. Therefore, tests that are recommended to conduct for future research are: 1) a validity test, to measure per case and the overall validity of the results; 2) the independent sample T-test to compares mean (s) to test hypotheses; 3) a paired sample T-test, prior and after training in EI; 4) an analysis of variances (ANOVA) to measure the averages and to test hypotheses regarding the TAM2 model. It is vital that the cases for future research should have a larger quantity of employees, team leaders, and high-level leaders in the process of radical technical

changes with tangible I4.0 products. It would then be suggested that the extended TAM model (TAM2) would be used completely. This contrasts with the adapted TAM2 model used in this study. It would be beneficial for the reason that it is including all of its variables (Venkatesh & Davis, 2000) to measure the employee technology acceptance with a broader insight.

This study provides the interaction of EI and radical technical innovation change projects such as I4.0, and suggest that the improvement of EI may be, in part, significantly valuable for the adoption of I4.0. However, EI is only a part of the variables that influence I4.0 adoption. Therefore, a future study could investigate the effects of broader age groups and gender, since this was a homogeneous study, due to the available sample at the time. In addition, a suggestion is to conduct this study in pleural industries, industry-specific. Further recommendation for future studies is to conduct this study internationally, taking into account the cultural (company) differences, language barriers, and customs. International research could benefit our neighbouring countries, when trading, working, and sharing knowledge together, for faster implementation of successful I4.0.

Practical Implications

Although the change projects during this research are focused on radical technical changes, when changes are less disruptive, the findings from this study could also be applied. Furthermore, the practical implications distilled from this study can help, support, and provide insight on change projects on multiple fronts. For example, recruiting and selecting suitable personnel for a technical change process. The recruitment staff could select candidates with an above-average EI score, in addition to other competencies. In addition, prior to a planned change, lessons and training on increasing EI can be given to employees, team leaders, and high-level leaders.

Moreover, managers can have teams who have undergone unsuccessful radical technical change complete EI tests to rule out whether it was the employees' low EI, or other factors that partially prevented successful change. The aforementioned practical implications may lead to better involvement, better understanding and better adoption of radical technical innovations such as I4.0.

Finally, this study proposes that organisations and universities invest in anticipatory education of EI, to gain early understanding of the effect of EI on the next radical technical innovations, such as I4.0 or even I5.0, as extreme integration by I4.0 (Özdemir & Hekim, 2018). Since ‘Industry 5.0 is poised to harness extreme automation and Big Data with safety,

innovative technology policy, and responsible implementation science, enabled by 3D symmetry in innovation ecosystem design' (Özdemir & Hekim, 2018, p. 5). We cannot start early enough; the future is now.

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Index of Appendix

Appendix 1: Scopus Search Terms for Mentioned Statistics

Scopus search term 1, listed by amount of references:

TITLE-ABS-KEY(industry 4.0) AND (LIMIT-TO (PUBYEAR,2018) OR LIMIT-TO (PUBYEAR,2017) OR LIMIT-TO (PUBYEAR,2016) OR LIMIT-TO (PUBYEAR,2015) OR LIMIT-TO (PUBYEAR,2014))

Scopus search term 2, listed by newest date

TITLE-ABS-KEY(industry 4.0) AND (LIMIT-TO (PUBYEAR,2018) OR LIMIT-TO (PUBYEAR,2017) OR LIMIT-TO (PUBYEAR,2016)

Amount of articles researching Industry 4.0 for introduction reference

TITLE-ABS-KEY (industry 4.0) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "cp")) AND (LIMIT-TO (SUBJAREA , "ENGI") OR LIMIT-TO (SUBJAREA , "COMP") OR LIMIT-TO (SUBJAREA , "ENVI") OR LIMIT-TO (SUBJAREA , "BUSI"))

Amount of articles and analysis of cyber-physical systems publications

TITLE-ABS-KEY (cyber-physical AND systems)

Appendix 2: Semi-structured Interview

This is the semi-structured interview guideline in Dutch language.

The start of the interview is preceded by a cup of coffee / tea, a relaxing chat and an agreement on the current "I4.0 as a radical technological change within the company" which is central to the upcoming interview. Furthermore, permission is requested for the audio recording during the interview and the consent form is requested (see Appendix 5), with which the respondent agrees with the data collection and participation in the study.

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1. Kunt u zich voorstellen?
2. leeftijd
3. functie
4. werkzaam in huidige functie sinds
5. werkzaam in huidige bedrijf sinds
6. opleidingsniveau
7. Wat kunt u mij globaal vertellen over dit bedrijf, het type werk en de cultuur?
8. Wat voor veranderingen heeft het bedrijf de afgelopen jaren ondergaan?
9. Wat is uw eerste respons op verandering in het bedrijf?
10. Hoe denkt u dat dit komt?
11. Welke verandering heeft het bedrijf meegemaakt omtrent radicale technische veranderingen zoals I4.0 toepassingen?
12. Wat zijn de beweegredenen geweest voor deze specifieke verandering?
13. Hoe zijn die veranderingen algemeen gecommuniceerd?
14. Wat is er specifiek voor uw functie veranderd?
15. Hoe hebben uw hiërarchische leiders gecommuniceerd over deze verandering naar de medewerkers?
16. Wat voor effect had die wijze van communicatie op de gevoelens/ emoties die u ervoer?
17. In hoeverre steunt u het I4.0 veranderproject?
18. Welke voorbeelden kunt u daar bij geven/ hoe steunt u het project bijvoorbeeld?
19. Wat deed de verandering met uw gevoel?
20. In hoeverre werden deze gevoelens herkend door uw leidinggevende en collega’s?
21. Wat werd met die informatie mee gedaan?
22. Wat was het effect daarvan?

23. Wat wilt u kwijt over de adoptie van het veranderproject dat nog niet aan bod is gekomen?

After the interview, I indicate that these were the questions and I thank the person for his time and energy. Afterwards there is a moment for additional questions or additions from the interviewee when desired.

Appendix 3: Extended Adapted TAM2 Survey

Construct	#	Code	Question
Intention to use	1.	INT1	Ervan uitgaande dat ik toegang heb tot het ... -systeem, ben ik van plan het te gebruiken
Perceived usefulness	2.	PUF1	Door het ... -systeem te gebruiken, verbeter ik mijn prestaties in mijn werk
	3.	PUF2	Het gebruik van het systeem in mijn werk verhoogt mijn productiviteit
	4.	PUF3	Ik vind het ... systeem nuttig in mijn werk
Perceived ease of use	5.	PEU1	Mijn interactie met het ... systeem is duidelijk en begrijpelijk
	6.	PEU2	Ik vind het ... systeem eenvoudig te gebruiken
	7.	PEU3	Ik vind het gemakkelijk om het systeem te laten doen wat ik wil
Subjective norm	8.	SN1	Mensen die belangrijk voor me zijn, denken dat ik het ... systeem moet gebruiken
	9.	SN2	Mijn managers / supervisors waren voorstander van de introductie van het ... systeem
	10.	SN3	Tijdens de introductie was er een "kampioen" beschikbaar om mijn vragen over de functies en het gebruik van het ... systeem te beantwoorden
	11.	SN4	Mijn collega-collega's waren enthousiast tijdens de introductie van het ... systeem
Voluntariness	12.	VOL1	Mijn gebruik van het ... systeem is vrijwillig

Appendix 4: Survey for Quantitative Approach

Beste Deelnemer,

Voor u ligt een vragenlijst met als doel er achter te komen wat uw mening is over de huidige innovatie binnen uw bedrijf en wat voor u de effecten zijn. Uw antwoorden op de onderstaande vragen zullen anoniem behandeld worden en zijn op geen enkele wijze terug te leiden naar u. Deze vragenlijst gebruik ik enkel voor mijn master scriptie voor de studie Master Business Administration aan de Universiteit Twente.

Ik wil u bij voorbaat bedanken voor uw tijd en energie.

Met hartelijke groeten,

Mark van Duuren, Master student aan de Universiteit Twente

Kennis over **uzelf**

		Helemaal niet mee eens	Niet mee eens	Een beetje niet mee eens	Niet eens of oneens	Een beetje mee eens	Mee eens	Helemaal mee eens
	Vraag	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	Ik heb meestal een goed besef waarom ik bepaalde gevoelens heb							
2	Ik begrijp mijn eigen emoties goed							
3	Ik weet altijd of ik blij ben of niet							
4	Ik begrijp echt wat ik voel							
5	Ik kan altijd de emoties van mijn vrienden afleiden uit hun gedrag							
6	Ik ben een goede observeerder van emoties van anderen							
7	Ik ben gevoelig voor de gevoelens en emoties van anderen							
8	Ik begrijp de emoties van mensen om mij heen goed							

9	Ik stel mijzelf altijd doelen en doe mijn best om deze te bereiken							
10	Ik vertel mezelf altijd dat ik een competent persoon ben							
11	Ik ben een zelfmotiverend persoon							
12	Ik zal mijzelf altijd aanmoedigen om mijn best te doen							

		Helemaal niet mee eens	Niet mee eens	Een beetje niet mee eens	Niet eens of oneens	Een beetje mee eens	Mee eens	Helemaal mee eens
	Vraag	**1**	**2**	**3**	**4**	**5**	**6**	**7**
13	Ik ben in staat om mijn kalmte te bewaren, zodat ik moeilijkheden rationeel kan aanpakken							
14	Ik ben heel goed in staat om mijn eigen emoties te beheersen							
15	Ik kan altijd kalmeren als ik erg boos ben							
16	Ik heb goede controle over mijn eigen emoties							

Kennis over uw **direct** leidinggevende

		Helemaal niet mee eens	Niet mee eens	Een beetje niet mee eens	Niet eens of oneens	Een beetje mee eens	Mee eens	Helemaal mee eens
	Vraag	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	Hij/zij heeft meestal een goed besef waarom hij/zij bepaalde gevoelens heeft							
2	Hij/zij begrijpt zijn/haar eigen emoties goed							
3	Hij/zij weet altijd of hij/zij blij is of niet							
4	Hij/zij begrijp echt wat hij/zij voelt							
5	Hij/zij kan altijd de emoties van zijn/ haar vrienden afleiden uit hun gedrag							
6	Hij/zij is een goede observeerder van emoties van anderen							
7	Hij/zij is gevoelig voor de gevoelens en emoties van anderen							

8	Hij/zij begrijp de emoties van mensen om hem/haar heen goed							
9	Hij/zij stelt zichzelf altijd doelen en doet zijn/haar best om deze te bereiken							
10	Hij/zij vertelt zichzelf altijd dat Hij/zij een competent persoon is							
11	Hij/zij is een zelfmotiverend persoon							
		Helemaal niet mee eens	Niet mee eens	Een beetje niet mee eens	Niet eens of oneens	Een beetje mee eens	Mee eens	Helemaal mee eens
	Vraag	**1**	**2**	**3**	**4**	**5**	**6**	**7**
12	Hij/zij zal zichzelf altijd aanmoedigen om zijn/haar best te doen							
13	Hij/zij is in staat om zijn/haar kalmte te bewaren, zodat hij/zij moeilijkheden rationeel kan aanpakken							
14	Hij/zij is heel goed in staat om zijn/haar eigen emoties te beheersen							
15	Hij/zij kan zichzelf altijd kalmeren als hij/zij erg boos is							

16	Hij/zij heeft goede controle over zijn/haar eigen emoties							

Verdieping over uw mening omtrent het lopende project **[I4.0 innovatie]**

		Helemaal niet mee eens	Niet mee eens	Een beetje niet mee eens	Niet eens of oneens	Een beetje mee eens	Mee eens	Helemaal mee eens
	Vraag	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	Ervan uitgaande dat ik toegang tot [I4.0 innovatie] heb, ben ik van plan het te gebruiken							
2	Aangezien ik toegang heb tot [I4.0 innovatie], voorspel ik dat ik het zou gebruiken							
3	Het gebruik van [I4.0 innovatie] verbetert mijn prestaties in mijn werk							
4	Het gebruik van [I4.0 innovatie] in mijn werk verhoogt mijn productiviteit							
5	Het gebruik van [I4.0 innovatie] verbetert mijn effectiviteit in mijn werk							
6	Ik vind [I4.0 innovatie] nuttig voor mijn werk							
7	Mijn interactie met [I4.0 innovatie] is duidelijk en begrijpelijk							

8	Het werken met [I4.0 innovatie] vereist niet veel van mijn mentale inspanning							
9	Ik vind [I4.0 innovatie] gemakkelijk te gebruiken							
10	Ik vind het gemakkelijk om [I4.0 innovatie] te laten doen wat ik wil							
11	Mensen die mijn gedrag beïnvloeden, vinden dat ik [I4.0 innovatie] moet gebruiken							
		Helemaal niet mee eens	Niet mee eens	Een beetje niet mee eens	Niet eens of oneens	Een beetje mee eens	Mee eens	Helemaal mee eens
	Vraag	**1**	**2**	**3**	**4**	**5**	**6**	**7**
12	Mensen die belangrijk voor me zijn, denken dat ik [I4.0 innovatie] moet gebruiken							
13	Mijn gebruik van [I4.0 innovatie] is vrijwillig							
14	Mijn supervisor vereist niet dat ik [I4.0 innovatie] gebruik							
15	Hoewel het misschien handig is, is het gebruik van [I4.0 innovatie] zeker niet verplicht in mijn werk							

Innovatie ondersteuning door het management en het bedrijf

		Helemaal niet mee eens	Niet mee eens	Een beetje niet mee eens	Niet eens of oneens	Een beetje mee eens	Mee eens	Helemaal mee eens
	Vraag	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	Mijn manager motiveert me om naar hem / haar te komen met nieuwe ideeën							
2	Mijn manager beloont altijd goede ideeën							
3	Mijn manager ondersteunt mij bij het zo snel mogelijk implementeren van goede ideeën							
4	Mijn manager is tolerant ten opzichte van fouten tijdens de implementatie van iets nieuws							
5	Mijn manager is in staat om ook buiten onze afdeling ondersteuning te krijgen voor mijn voorstel							
6	De manier van belonen in onze organisatie motiveert medewerkers om nieuwe dingen en procedures te suggereren							
7	Onze organisatie heeft voldoende middelen gereserveerd om de							

	implementatie van nieuwe ideeën te ondersteunen							
8	Onze organisatie biedt medewerkers tijd om ideeën en innovaties in de praktijk te brengen							

Innovatieve toepassingen binnen uw bedrijf

Geef aan in hoeverre uw bedrijf gebruik maakt van de volgende innovatieve toepassingen:

		Niet in gebruik	Van plan om ooit te gaan gebruiken	In voorbereiding om te gaan gebruiken	Bijna in gebruik	Een beetje in gebruik	Grotendeels in gebruik	Volledig in gebruik
	Vraag	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	Digitale automatisering zonder sensoren							
2	Digitale automatisering met sensoren voor procesbesturing							
3	Monitoring en controle van productie op afstand							
4	Digitale automatisering met sensoren voor identificatie van producten en operationele omstandigheden							
5	Geïntegreerde technische systemen voor productontwikkeling en productfabricage							

vragenlijst werknemers binnen het bedrijf …….. op de afdeling …….

Geslacht:	Man/vrouw
Leeftijd:	16-20/21-30/31-40/41-50/51-67
Functie:	Medewerker/teamleider/management
Jaren werkzaam in huidige functie:	0-3/4-8/9-12/13-19/19+
Jaren werkzaak bij huidige organisatie:	0-3/4-8/9-12/13-19/19+
Hoogst genoten opleidingsniveau:	VMBO/MBO/HBO/WO/ anders

Hartelijk bedankt voor het invullen van deze vragenlijst. Hieronder heeft u de mogelijkheid om nog aanvullende informatie te plaatsen of opmerkingen die u heeft ter verbetering van het onderzoek.

Appendix 5: Informed Consent

INFORMED CONSENT FORMULIER

Naam van het onderzoeksproject

Smart Industry Adoptie

Doel van het onderzoek

Dit onderzoek wordt geleid door Mark van Duuren, Master student aan de Universiteit Twente. U bent van harte uitgenodigd om deel te nemen aan dit onderzoek. Het doel van dit onderzoek is om te bepalen hoe u invloed heeft op de innovatie in de richting van Smart Industry in uw bedrijf.

Gang van zaken tijdens het onderzoek

U neemt deel aan een interview waarin aan u vragen zullen worden gesteld over uw mening richting de innovaties binnen uw bedrijf. Een voorbeeld van een typische vraag die u zal worden gesteld: Wat voor veranderingen heeft het bedrijf de afgelopen jaren ondergaan?".

U dient tenminste 16 jaar te zijn om deel te nemen aan dit onderzoek.

Voorafgaand aan het interview vullen alle deelnemers een korte vragenlijst in. Hierin staan onder andere vragen over achtergrondgegevens, persoonlijke eigenschappen. Tijdens het interview zal, aan de hand van een topic list, dieper worden ingegaan op uw mening richting de innovaties binnen uw bedrijf. Van het interview zal een audio-opname worden gemaakt, zodat het gesprek later ad-verbum (woord voor woord) kan worden uitgewerkt.
Dit transcript wordt vervolgend gebruikt in het verdere onderzoek.

Potentiële risico's en ongemakken

- Er zijn geen fysieke, juridische of economische risico's verbonden aan uw deelname aan deze studie. U hoeft geen vragen te beantwoorden die u niet wilt beantwoorden. Uw deelname is vrijwillig en u kunt uw deelname op elk gewenst moment stoppen.

Vertrouwelijkheid van gegevens

Uw privacy is en blijft maximaal beschermd. Er wordt op geen enkele wijze vertrouwelijke informatie of persoonsgegevens van of over u naar buiten gebracht, waardoor iemand u zal kunnen herkennen.

Voordat onze onderzoeksgegevens naar buiten gebracht worden, worden uw gegevens **anoniem** gemaakt of geanonimiseerd. Enkele eenvoudige voorbeelden hiervan:
- uw naam wordt vervangen door anonieme, op zichzelf betekenisloze combinatie van getallen.
- uw leeftijd zelf wordt niet verwerkt, maar in een categorie geplaatst. Bijvoorbeeld: leeftijd: tussen 18-25 jaar / tussen 25-35 jaar etc.
- uw woonplaats wordt niet gebruikt, maar de provincie waarin u woont.

Bij de start van ons onderzoek krijgt uw naam direct een **pseudoniem**; uw naam wordt gepseudonimiseerd ofwel ‘versleuteld’. Op deze manier kan wel worden onderzocht wat u in het gesprek aangeeft, maar weten de getrainde onderzoekers niet dat u het bent. De onderzoeksleider is zelf verantwoordelijk voor dit pseudoniem en de sleutel en zal uw gegevens niet delen met anderen.

In een publicatie of presentatie zullen of anonieme gegevens of pseudoniemen worden gebruikt. De audio-opnamen, formulieren en andere documenten die in het kader van deze studie worden gemaakt of verzameld, worden opgeslagen op een beveiligde locatie bij de Universiteit Twente en op de beveiligde (versleutelde) computers van de onderzoekers.

Vrijwilligheid

Deelname aan dit onderzoek is geheel vrijwillig. Je kunt als deelnemer jouw medewerking aan het onderzoek te allen tijde stoppen, of weigeren dat jouw gegevens voor het onderzoek mogen worden gebruikt, zonder opgaaf van redenen.

Dit betekent dat als je voorafgaand aan het onderzoek besluit om af te zien van deelname aan dit onderzoek, dat dit op geen enkele wijze gevolgen voor jou zal hebben. Tevens kun je tot vijf werkdagen (bedenktijd) na het interview alsnog de toestemming intrekken die je hebt gegeven om gebruik te maken van jouw gegevens.

In deze gevallen zullen jouw gegevens uit onze bestanden worden verwijderd en vernietigd. Als je tijdens het onderzoek, na de bedenktijd van vijf werkdagen, besluit om jouw medewerking te staken, zal dat eveneens op geen enkele wijze gevolgen voor je hebben. Echter: de gegevens die u hebt verstrekt tot aan het moment waarop uw deelname stopt, zal in

het onderzoek gebruikt worden, inclusief de bescherming van uw privacy zoals hierboven beschreven. Er worden uiteraard geen nieuwe gegevens verzameld of gebruikt.

Als u besluit om te stoppen met deelname aan het onderzoek, of als u vragen of klachten heeft, of uw bezorgdheid kenbaar wilt maken, of een vorm van schade of ongemak vanwege het onderzoek, neemt u dan aub contact op met de onderzoeksleider:
Mark van Duuren, m.vanduuren@utwente.nl

Toestemmings-verklaring

Met uw ondertekening van dit document geeft aan dat u minstens 16 jaar oud bent; dat u goed bent geïnformeerd over het onderzoek, de manier waarop de onderzoeksgegevens worden verzameld, gebruikt en behandeld en welke eventuele risico's u zou kunnen lopen door te participeren in dit onderzoek.

Indien u vragen had, geeft u bij ondertekening aan dat u deze vragen heeft kunnen stellen en dat deze vragen helder en duidelijk zijn beantwoord. U geeft aan dat u vrijwillig akkoord gaat met uw deelname aan dit onderzoek. U ontvangt een kopie van dit ondertekende toestemmingsformulier.

Ik ga akkoord met deelname aan een onderzoeksproject geleid door dhr. Mark van Duuren. Het doel van dit document is om de voorwaarden van mijn deelname aan het project vast te leggen.

1. Ik kreeg voldoende informatie over dit onderzoeksproject. Het doel van mijn deelname als een geïnterviewde in dit project is voor mij helder uitgelegd en ik weet wat dit voor mij betekent.

2. Mijn deelname als geïnterviewde in dit project is vrijwillig. Er is geen expliciete of impliciete dwang voor mij om aan dit onderzoek deel te nemen.

3. Mijn deelname houdt in dat ik word geïnterviewd door (a) onderzoeker (s) van de Universiteit Twente. Het interview zal ongeveer 20 minuten duren. Ik geef de onderzoeker (s) toestemming om tijdens het interview opnames (geluid / beeld) te maken en schriftelijke notities te nemen. Het is mij duidelijk dat, als ik toch bezwaar heb met een of meer punten zoals hierboven benoemd, ik op elk moment mijn deelname, zonder opgaaf van reden, kan stoppen.

4. Ik heb het recht om vragen niet te beantwoorden. Als ik me tijdens het interview ongemakkelijk voel, heb ik het recht om mijn deelname aan het interview te stoppen.

5. Ik heb van de onderzoeksleider de uitdrukkelijke garantie gekregen dat de onderzoeksleider er zorg voor draagt dat ik niet ben te identificeren in door het onderzoek naar buiten gebrachte gegevens, rapporten of artikelen. Mijn privacy is gewaarborgd als deelnemer aan dit onderzoek.

6. Ik heb de garantie gekregen dat dit onderzoeksproject is beoordeeld en goedgekeurd door de ethische commissie van de BMS Ethics Committee. Voor bezwaren met betrekking tot de opzet en of uitvoering van het onderzoek kan ik me wenden tot de Secretaris van de Ethische Commissie van de faculteit Behavioural, Management and Social Sciences op de Universiteit Twente via ethicscommittee-bms@utwente.nl.

7. Ik heb dit formulier gelezen en begrepen. Al mijn vragen zijn naar mijn tevredenheid beantwoord en ik ben vrijwillig akkoord met deelname aan dit onderzoek.
8. Ik heb een kopie ontvangen van dit toestemmingsformulier dat ook ondertekend is door de interviewer.

_____	_____	_____
Naam deelnemer	Handtekening	Datum
Mark van Duuren	_____	_____
Naam Onderzoeker	Handtekening	Datum