The role of leadership and emotional intelligence in times of adopting new Industry 4.0 technologies

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How do transformational and instrumental leadership, combined with a leader's emotional intelligence, affect employees' adoption of Industry 4.0 technologies in the logistics sector?

Abstract

Purpose: Evermore organizations opened their doors for the digital transformation, also known as Industry 4.0, as it can be a decisive enabler of ensuring competitive advantage. To make that transition as smooth and fruitful as possible, employee's acceptance of such new revolutionary technologies is pivotal. However, few studies have investigated the determinants of employee acceptance. Hence, this study attempts to investigate how manager's leadership style, specifically, transformational leadership, and instrumental leadership, as well as manager's and employee's emotional intelligence affect employee's acceptance of Industry 4.0 technologies, and eventually, their adoption to Industry 4.0 technologies.

Theoretical background: This study makes primarily use of the Unified Theory of Acceptance and Use of Technology (UTAUT), indicating four different factors that determine individual's willingness to use new technologies. To cover external factors influencing individual's technology adoption, this study focuses on the transformational leadership theory, relating to manager's motivational aspects, and the instrumental leadership theory, relating to manager's strategic and task-monitoring aspects. In addition, emotional intelligence is considered as a novel factor.

Methodology: The German-based logistics organization made use of Industry 4.0 technologies in their daily business, including Smart Supply Chain and Smart Working. A mix of qualitative and quantitative methods was used, consisting of 13 semi-structured interviews, and surveys (N=40) with team leaders and employees, engaging in the Industry 4.0 technology adoption process.

Findings: The qualitative results showed that adopting transformational and instrumental leadership styles contribute to employee's Industry 4.0 technology adoption, extending the existing UTAUT model. Moreover, manager's and employee's emotional intelligence are suggested as an additional factor contributing to employee's technology acceptance and therefore, further extend the UTAUT model. Additionally, the quantitative findings corroborate some of the qualitative findings in relation to perceived ease of use and facilitating conditions for both transformational and instrumental leadership, while they contradict them in terms of performance expectancy and social influence for both leadership styles. Further, they support the effect of emotional intelligence on facilitating conditions, while they contradict the effect on social influence.

Implications & Future Research: This study has both theoretical and practical implications. First, transformational and instrumental leadership have been suggested as potential antecedents to the UTAUT model, affecting all its four sub-dimensions. Second, both employee's and team lead's emotional intelligence have been suggested to moderating the effect of facilitating conditions and social influence. Practical implications related to organization's culture are suggested. Further, training sessions on both technological knowledge and emotional intelligence are proposed, to cover both employee's and manager's hard and soft skills. Moreover, besides technological savvy, organizations should focus on emotional intelligence in the recruitment process. Additionally, implications for future research are proposed.

Keywords: Emotional intelligence, Industry 4.0, Instrumental leadership, Transformational leadership, Unified Theory of Acceptance and Use of Technology

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1. Introduction

Disruptive technological revolutions have detrimentally transformed industries and ergo led organizations to continuously rethink their status quo of doing business and adapt it accordingly. Those paradigm shifts are known as "Industrial Revolutions", whereof to date four in total exist (Lasi et al., 2014). Prevailing, organizations are confronted with the Fourth Industrial Revolution that experienced its rise by the eminently fast-paced development of technological advancements of the 21st century (Popkova et al., 2018). Also used synonymously with terms like "Industry 4.0", "Smart Manufacturing", or "Digital Transformation" (Culot et al., 2020), the Fourth Industrial Revolution embraces the integration of cyber-physical systems into manufacturers' production systems, making the value chains more decentralized, smart, and interconnected, which in turn yields products and services with elevated efficiency, customizability, and connectedness (Piccarozzi et al., 2018). Despite the given fact that Industry 4.0 is still in its infancy, from a research perspective (Kiel et al., 2017) as well as from a managerial perspective (Strange & Zucchella, 2017), academia expects that it will become ubiquitous and inevitable for organizations to adapt their business to new Industry 4.0 processes (Kumar et al., 2020; Lee et al., 2014) since it is a decisive factor for ensuring competitive advantage (Masood & Sonntag, 2020). New technological developments such as the Fourth Industrial Revolution have become increasingly important on a global scale as digitization has become the "bones and sinews of globalization" (Chareonwongsak, 2002, p. 191).

Globalization resulted in a global interconnectedness, defining the world as "global village" (Zembylas & Vrasidas, 2005). This process of integration caused a remarkable growth in international trades. The logistics and transport sectors as main facilitators of international trade are viewed to hold a highly important role in the growth and development of local economies (Gani, 2017). Speaking in economic terms, in 2014 global exports were forty-fold larger than only a century ago (Ortiz-Ospina & Beltekian, 2014). According to statistics, the global logistics industry was worth 8.6 trillion dollars in 2020 (Statista Search Department, 2022a). To put it in perspective: This is almost threefold the market size of the automotive manufacturing market in 2020 (Statista Search Department, 2022b). Moreover, the logistics sector accounts for 10-15% of the global GDP (Rodrigue, 2020). Thus, the logistics sector has become a main driver of economic development for developed and developing countries alike (Hausman et al., 2013; Sharipbekova & Raimbekov, 2018). Especially the quality and efficiency of logistics services play a tremendously important role in today's international trade. Thus, weak infrastructure and processes can be detrimental to getting a foothold in global trade (Devlin & Yee, 2005).This is congruent with Hausmann et al. (2013) who stress that it has become pivotal for countries to improve logistics' performance to increase international trade and gain competitive advantage which

can be achieved by implementing Industry 4.0 technologies into logistics processes (Moldabekova et al., 2021; Tang & Veelenturf, 2019).

An existing plethora of recent research evidence its multiple benefits, including high transparency of supply chains, improved production planning, real-time information flow, enhancements in flexibility, and increased efficiency (Barreto et al., 2017; Hofmann & Rüsch, 2017; Tang & Veelenturf, 2019). In fact, Big Data and advanced analytics as part of Industry 4.0 are seen as operational game changers, especially in supply chain management (Waller & Fawcett, 2013). Given the outlined benefits, it can be reasoned that implementing Industry 4.0 technologies into the supply chain management might ensure organizations competitive advantage.

Yet, despite existing benefits of Industry 4.0 implementation in logistics operations, still a lack of perceived usefulness and significance exists. While the Third Industrial Revolution, including Information and Communication Technologies (ICT) as a means of ensuring more efficiency, has been majorly found in manufacturing and logistics (Barreto et al., 2017), the Fourth Industrial Revolution did not experience the same significance in logistics so far. According to a survey questioning 1600 C-level executives across 19 countries, 73% of the respondents reported developing Industry 4.0 technology initiatives to help improve manufacturing operations, while only 6% viewed it as important in logistics (Deloitte Insights, 2018). These results make it evident that many organizations undervalue the importance of implementing Industry 4.0 technologies in the logistics domain despite their potential benefits, which could be due to its relatively newness outlined by Strange and Zucchella (2017).

Despite the undervaluation of the topic, the economic importance of logistics and the potential benefits of Industry 4.0 technologies, it is worthwhile investigating the implementation of smart technologies in the logistics sector. This research can make a compelling contribution to raise awareness to that field.

Although the implementation of such new Industry 4.0 technologies is highly pedestaled because of the many potential benefits, potential bottlenecks should not be left unaddressed. Besides barriers stemming from the management level, including the lack of understanding of the strategic relevance of implementing Industry 4.0 technologies (Schönreiter, 2017; Stentoft et al., 2021) and legislative barriers such as lack of standards (Huang et al., 2013; Trappey et al., 2017), the acceptance of Industry 4.0 technologies not rarely meets resistance from employees since they fear to be replaced or lack the necessary skills to use the new technologies (Horváth & Szabó, 2019; Müller, 2019), which is especially true for the least skilled workforce (Kumar et al., 2021). Employees are the backbone of every company and if they fail, the company might lose its competitive edge (Berger et al., 2003). A high degree of consensus among scholars exists that resistance to change is an integral hurdle that needs to be

overcome as quickly as possible if organizations have a keen interest in successfully implementing new technologies (Karadayi-Usta, 2020; Kiel et al., 2017; Jadhav et al., 2014). Furthermore, since employees differ largely in terms of perceiving changes and enacting adaptation strategies, organizations and their leaders must consider their employees' individual socio-emotional needs instead of looking for a cure-all approach to make employees more receptive to technology changes (Bala & Venkatesh, 2013). Yet, existing literature largely focuses on Industry 4.0 on a technology and strategy level without considering the complex structure of deeper laying social nexuses (Horváth & Szabó, 2019; Molino et al., 2021; Trotta & Garengo, 2019). Only recent research stresses the importance of considering the social aspect as well (Dayton-Johnson, 2001; Gorecky et al., 2014; Vacek, 2017; Van Dun & Kumar, 2023). Thus, since research regarding the social component in implementing new technologies is still in its infancy, this thesis can make a compelling contribution to the research domain by shedding light on the adoption of Industry 4.0 from both the social as well as the technical perspective within the logistics sector.

The socio-emotional aspects playing a role in adapting to new technologies can best be explained with the so-called Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). While it covers very well the individual attitude towards change, it gives no clear implications on how to change or influence it. This is where the role of leadership enters the stage. Indeed, there are accounts that leadership positively affects employees' information technology (IT) use and acceptance (Neufeld et al., 2007; Van Dun & Kumar, 2023). Therefore, research advises integrating leadership theory into the Technology Acceptance Model to also cover the influence of management support and how it can affect employees' attitudes to change (Schepers et al., 2005; Young, 2020). In combination with technology acceptance, leadership research found that the transformational leadership style had a positive influence on followers' acceptance of new technologies (Schepers et al., 2005). While the transformational leadership model considers the motivational, psychological impact on employees, it leaves leaders' strategic and task-monitoring-related actions largely unaddressed (Antonakis & House, 2013). If employees are not yet familiar with new technology and do not receive any support in how to use them, there is no benefit of that technology over working without it (Dennis et al., 2001). Thus, besides the motivational aspect of leadership, this research suggests the importance of making sure that employees' evoked intentions are also put into necessary actions. Hence, besides the transformational leadership (Bass, 1985), it incorporates the role of instrumental leadership (Antonakis & House, 2014). The approach of this thesis in terms of leadership is therefore twofold as transformational leadership provides inspiration and motivation among employees while instrumental leadership ensures successful execution of the intended endeavor. Important to note is to make a change successful, effective leadership styles do not exist in a vacuum but can rather be used

intertwined. Academia stresses that a combination of the right leadership styles can even yield more positive outcomes than leadership styles standing alone (Bedell-Avers et al., 2009).

The introduction of new Industry 4.0 technologies at the workplace can cause resistance from employees as they have the potential to entirely alter workplace structures (Horváth & Szabó, 2019; Müller, 2019). This digitalization-induced change can have severe negative effects on employees' underlying emotional mechanisms as it can induce emotional ambivalence (Fong, 2006), and cognitive ambivalence (Pacilli et al., 2013), which are seen as potential repercussions of such technology-based workplace changes (Schneider & Sting, 2020). Since influencing employees and changing their attitudes towards change closely links to understanding their emotions and why they are averse, skeptical, or ambiguous to change, change management's degree of success thus depends on the level of leaders' emotional intelligence (Gelaidan et al., 2018) which has been positively related to employees' job performance and job satisfaction (Chrusciel, 2006; Wong & Law, 2017) and stimulation of employees' creativity (Zhou & George, 2003). Similarly, employees with a high level of emotional intelligence are found to show a higher level of acceptance of new technologies at work since they can empathize with the need for change (Khasawneh, 2018). Indeed, existing research found a link between emotional intelligence and successful Industry 4.0 technology adoption (Van Dun & Kumar, 2023).

For those reasons, this research focuses on the role of leadership while at the same time including leaders' as well as employees' emotional intelligence in influencing employees' adoption of new technological changes. Since organizational leaders have the authority to make decisions about implementing new technologies into their business operations, understanding the underlying socio-emotional nexuses of employees' attitudes towards these changes is key to taking respective countermeasures. Therefore, the following research question is explored:

How do transformational and instrumental leadership, combined with leaders' and employees' emotional intelligence, affect employees' adoption of Industry 4.0 technologies in the logistics sector?

Choosing a case study approach in which data triangulation was used by applying a mixed method design, this research aims to extend existing academic literature on successful Industry 4.0 implementation. The contribution of this research is four-fold. First, it aims to emphasize the importance of social aspects of adopting new technologies by focusing especially on the effect of employee's and manager's emotional intelligence on successful Industry 4.0 technology adoption. Secondly, it highlights both transformational and instrumental leadership styles as crucial concepts for

successful Industry 4.0 technology implementation. Thirdly, the conceptual model extends the UTAUT model and gives input and inspiration to future academics in similar research domains. Lastly, this study can serve managers as a compass giving them direction as to how they can best get employees on board and ensure their active participation in navigating through the sea of digital transformation.

This study is structured as follows: Chapter 2 presents the literature review, informing about the theoretical concepts used. Chapter 3 entails a description of the research methodology and process for the quantitative and qualitative approach. In chapter 4 the findings of the study are outlined, followed by a discussion in chapter 5. Chapter 6 provides valuable practical implications for organizations and theoretical implications for future research, closing with the conclusion in chapter 7.

2. Literature review

In the following, the related literature is discussed. First, the concept of radical innovation and Smart Industry (Industry 4.0) is outlined to better understand how they connect, followed by introducing the Unified Theory of Acceptance and Use of Technology (UTAUT) model to understand individual's internal mechanisms playing a role in the technology adoption process. Furthermore, the concept of transformational and instrumental leadership is outlined as they cover the external, organizational-level role of employee's technology adoption process. Lastly, as new technological changes might affect the socio-emotional aspects of individuals, this chapter ends with an explanation of the theory of Emotional Intelligence (EI) as an additional indicator of technology adoption.

2.1. Radical innovation and Smart Industry

When speaking of innovation, it can be distinguished between two main differences, incremental innovation, and radical innovation. The former is concerned with innovating and improving existing products and services, whereas the latter is concerned with disrupting existing markets and hence creating entirely new business models (Lassen et al., 2006). According to O'Connor and Ayers (2005, p. 24) radical innovation can be defined as "the commercialization of products and technologies that have strong impact on 1) the market, in terms of offering wholly new benefits, and 2) the firm, in terms of its ability to create new businesses". Hence, change in both the market and the organization takes place.

Smart Industry, synonymously used with Industry 4.0 or Smart Manufacturing, to name a few, is a new Industrial Revolution that refers to a collective of new technological developments, integrating cyber-physical systems in day-to-day business operations to increase work efficiency (Lasi et al., 2014).

Industry 4.0 can be divided into front-end technologies for instance collaborative robots, Augmented Reality (AR), Virtual Reality (VR), Additive manufacturing, and sensors, to name a few (Dalenogare et al., 2018; Frank et al., 2019), which are highly reliant upon base technologies, including Internet of Things (IoT), cloud services, big data, and analytics (Frank et al., 2019; Wang et al., 2015). Given its disruptive nature, Industry 4.0 can be considered radical innovation since it has the potential to entirely change business models (Ibarra et al., 2018) which especially holds true for supply chain management (Holmström et al., 2016; Rüßmann et al., 2015). Industry 4.0 implemented into the domain of logistics created a novel paradigm known as Logistics 4.0, which is according to Barreto et al. (2017, p. 1252): "the optimization of inbound and outbound logistics which must be supported by intelligent systems, embedded in software and databases from which relevant information is provided and shared through Internet of Things (IoT) systems, in order to achieve a major automation degree". Since such full-scale changes of radical innovation turn markets and businesses alike upside down, the socio-economic part of organizations is not left unaffected and alterations in handling organizations' human capital are evoked since employees must adapt accordingly to new ways of doing business (Sima et al., 2020). Depending on the type and the way the organizational change is implemented, the resistance to the change varies in intensity (Zafar & Naveed, 2014). Thus, since Industry 4.0 is considered radical innovation, meaning the type of change is extremely high, it can be assumed that employees' resistance is high in intensity. Also, people differ in personality and therefore, adaption to change might be easy for one, while the same change causes tremendous resistance to another (Nov & Ye, 2008; Oreg, 2006). In fact, it is important to note that resistance to change is something that appears at a later point when organizations are already capable of adopting Industry 4.0 technologies (Raj et al., 2020). As Henderson & Ruikar (2010, p. 325) stated: *"(..) the degree to which successful technology implementation is achieved ultimately depends on the degree to which change can be planned, managed and evaluated effectively. It is therefore not so much a technological problem as it is a human behavioural one"*. As socio-emotional factors play a role in the implementation of new technologies as well, the next section addresses the individual-level technology adoption facets playing a role by outlining the UTAUT model.

2.2. Unified Theory of Acceptance and Use of Technology (UTAUT)

Given that individual-level technology adoption is one of the most sophisticated research streams of the information systems (IS) domain (Venkatesh et al., 2007), it is vital for organizations to resort to the available knowledge to understand the underlying systems that govern employees' attitudes to the usage of new technologies. One of the most well-known and influential models to depict individual-level technology adoption, focusing on social factors, is the Technology Acceptance Model (TAM) (Al-Suqri & Al-Aufi, 2015; Y. Lee et al., 2003; Venkatesh & Davis, 2000). Initially coined by Davis (1986), it

theorizes that an individual's willingness to use new technologies is based on two determinants, which are *perceived usefulness*, reflecting the degree to which an individual thinks that the usage of new technologies will amplify their job performance; and *perceived ease of use*, defined as the degree to which an individual thinks that the usage of the technology is effortless (Venkatesh & Davis, 2000). It has since then been extended to the Technology Acceptance Model 2 (TAM2) which additionally incorporates *social influence processes*, including subjective norm, voluntariness, and image, and *cognitive instrumental processes*, including job relevance, output quality, result demonstrability, and perceived ease of use (Venkatesh & Davis, 2000) and further developed into an integrated model of technology acceptance, also known as Technology Acceptance Model 3 (TAM3) which additionally includes experience as a moderator for the relationships between perceived ease of use and perceived usefulness, computer anxiety and perceived ease of use, and perceived ease of use and behavioral intentions (Venkatesh & Bala, 2008). The afore-mentioned and other models have been encapsulated and the Unified Theory of Acceptance and Use of Technology (UTAUT), which is subject to this research, has been introduced. There are several reasons why the UTAUT is preferred over any other technology acceptance model. First, Venkatesh et al. (2003) compared it with myriads of other technology acceptance models and found that it has in several tests explained 70 percent of the variance in user intentions to use information technology and therefore outperformed the other models only scoring between 17 and 53 percent. Moreover, this research builds upon and aims to further validate the pilot groundwork of Van Dun and Kumar (2023) who used the UTAUT as a successful indicator in their studies. Lastly, the TAM ignores important technology use contributors such as voluntariness and social impact, while TAM2 and especially TAM2 are highly complex due to the multitude of variables it contains. The UTAUT compensates for the downsides, providing a succinct, easy to comprehend model that includes the missing factors of the TAM and demonstrated a high level of predictiveness in many technology contexts. The UTAUT amalgamates four core determinants of individuals' intention to adopt technologies and usage behavior, which are *performance expectancy*, reflecting the degree to which an employee thinks that the usage of the technology increases job performance, *effort expectancy*, described as the degree of effortlessness, *social influence*, reflecting the degree to which an employee believes to receive support from others, and *facilitating conditions*, which is the degree to which an employee thinks the right organizational and technical infrastructure exists to implement and use the new technology; additionally, it incorporates four moderating factors, including *age*, *gender*, *experience*, and *voluntariness* (Venkatesh et al., 2003, 2016). Hence, it becomes evident that for facilitating these four core determinants to help employees better adapt to new changes, the support factor plays an integral role. Myriads of research stress that managers and leaders are the core enablers for such support (Agostini & Nosella, 2019; Ooi et al., 2018; Premkumar & Roberts, 1999). Nevertheless,

while the UTAUT provides valuable insights into the underlying mechanisms of employees' attitudes towards new technology adoption, it does not provide any guidance for which steps can be taken to foster technology adoption (Brown et al., 2010). Moreover, as already outlined previously, employees need to receive support to become familiar with new technology, otherwise the technology does not provide companies any benefit over those working without it (Dennis et al., 2001). Therefore, this research explores how leaders can effectively promote employees' adoption to new technologies and concentrates on two leadership styles in specific which are transformational and instrumental leadership.

2.3. Transformational leadership

The importance of leadership in times of organizational changes, as is the case in implementing new technologies in the era of Industry 4.0, has been subject to a plethora of research (Dhanpat et al., 2020; Guzmán et al., 2020; Mansaray, 2019). Although a huge variety of leadership styles exists, not all fit into the same context equally well. Research stresses that the most frequently debated leadership style in the context of innovation has been the transformational leadership style (Afsar et al., 2014; Aryee et al., 2012; Slåtten, 2014). Transformational leadership was coined by Bass (1985) and can be divided into four sub-dimensions which are: *charismatic leadership*, describing leaders' faith, loyalty, and trust in themselves and their abilities, *inspirational leadership*, involving leaders arousing and increasing employees' motivation, *individualized consideration*, describing leaders' maintenance of employees' individual development, and *intellectual* stimulation, describing leaders' stimulation of employees' problem-solving capabilities. It was found that characteristics of the transformational leadership style positively impact the four determinants of the UTAUT model (Neufeld et al., 2007). However, there is also criticism to transformational leadership. Effective leadership often involves task and strategic-oriented behaviors such as clearly defining expected results, setting specific goals, planning, coordinating efforts, managing resources, and monitoring progress, yet this aspect is frequently overlooked in transformational leadership (Yukl, 1999, 2008). In other words, transformational leadership showcases a motivational, psychological impact on employees yet fails to address leaders' strategic monitoring and formulation roles. This gap is related to a type of leadership that performs both strategic and work-facilitation functions, known as instrumental leadership (Antonakis & House, 2014). Thus, next to the transformational leadership approach, the instrumental leadership theory compensating for the missing attributes, is proposed, which is introduced in a later section.

It has been found that transformational leadership has a positive influence on the TAM's sub-dimension *perceived usefulness* (Dong et al., 2007; Schepers et al., 2005) which resembles the UTAUTs dimension

of effort expectancy. Specifically, the authors found that this was fully accounted for by the sub-dimension of intellectual stimulation. In addition, a more recent study by Cho et al. (2011) also evidences a positive effect of transformational leadership on perceived usefulness. They argue that transformational leaders possess fine antennas to recognize their employees' different socio-emotional needs and development stage towards the technology, which enables them to provide tailored support to ensure that employees perceive the usefulness of the new technology. The TAM's *perceived usefulness* and the UTAUT's *performance expectancy* can be defined as the same concepts, as outlined previously (cf. 2.2 Unified Theory of Acceptance and Use of Technology (UTAUT)).

Further, researchers found that transformational leadership has a positive direct as well as indirect effect on employees' perceived ease of use of new technologies (Aziz et al., 2020; Elkhani et al., 2014). The argumentation is as follows: Transformational leaders encourage, motivate and stimulate employees to try new things and engage in problem-solving activities, which makes them more used to experimenting with the new technology, and ultimately, they will learn the facets of the technology more quickly. Perceived ease of use, as outlined previously in the TAM, has the same conceptualization as the UTAUT's dimension *effort expectancy* (cf. 2.2 Unified Theory of Acceptance and Use of Technology (UTAUT)). Moreover, leader support is a concept related to transformational leadership (Cheung & Wong, 2011), consisting of task support, which is to ensure employees have the right and sufficient resources, and relations support, which focuses on employees' socio-emotional concerns (Amabile et al., 2004). Especially relations support is present in the transformational leadership style since it considers employees' motivational and psychological aspects. In fact, the link that transformational leadership positively affects employees' perceived organizational support has been research and validated (Cho et al., 2011). Moreover, additional research evidence that transformational leadership style is associated with higher perceived social support (Lyons & Schneider, 2009). The reasoning goes as follows: Since transformational leaders consider employees' individual developmental needs, employees are more likely to perceive them as being supportive. In relation to new technologies at work, with individual consideration, employees will recognize that leaders consider their unique developmental needs so they can use the new system.

Additionally, facilitating conditions is concerned with the degree to which employees perceive that they are provided with the right resources and environment for enabling the use of new technologies (Venkatesh et al., 2003). The job demands-resources (JD-R) model (Bakker & Demerouti, 2007) focuses on two key factors for optimal employee functioning. First, job demands which are the exhausting physical, psychosocial, and organizational job aspects, and second, job resources which are the physical,

psychosocial, and organizational job aspects that support employees in their daily work (Demerouti et al., 2001). The former can be the origins of stress which can be attenuated or avoided when employees are provided with the right job resources. It was found that employees' perceptions of basic job conditions are highly dependent on how they perceive their managers' transformational leadership behavior (Piccolo & Colquitt, 2006). In specific, transformational leadership is found to shape employees' individual perceptions of the work and shape an environment that diminishes the job demands and increases the job resources needed (Fernet et al., 2015). Moreover, additional research found evidence that transformational leadership creates facilitating condition necessary for the usage and acceptance of new technology (Young, 2020).

Hence, based on the literature about the four determinants of the UTAUT model, we assume that transformational leadership might have a positive effect on performance expectancy, social influence, and facilitating conditions; and a negative effect on effort expectancy, and thus, affect the Industry 4.0 technology adoption.

2.4. Instrumental leadership

But transformational leadership is not the only leadership style which might play a role in Industry 4.0 technology adoption. Adaptation to the external environment and efficient use of resources is seen as integral parts of the DNA of successful leadership (Hunt, 1991), which is what leaders must pay special attention to (Hackman & Wageman, 2005; Morgeson, 2005). Specifically, it is integral to not only affect employees' interpersonal level but also show expertise, tackle complex challenges, and formulate and implement possible countermeasures (Connelly et al., 2000; Mumford et al., 2000). This is where the instrumental leadership style comes into play, which is defined by Antonakis & House (2014, p. 749) as: "the application of leader expert knowledge on monitoring of the environment and of performance, and the implementation of strategic and tactical solutions". It consists of the following four dimensions: *environmental monitoring*, meaning to check the internal and external environment to identify growth opportunities and provide appropriate working conditions and resources to employees, *strategy formulation*, meaning to design appropriate strategies and communicating objectives, *path-goal facilitation*, described as the identification of employees' tasks and providing suitable resources, and *outcome monitoring*, described as observing employees' performance and giving constructive feedback (Antonakis & House, 2014). Hence, leaders should adopt the transformational leadership style to cover the interpersonal connection to their employees, while at the same time maintaining an instrumental leadership style to ensure organizational goals do not fall short. Important to note is that leadership styles do not exist in a vacuum but can rather be used intermingled. In fact, research found that a

combination of the right leadership styles can even yield more positive outcomes (Bedell-Avers et al., 2009).

As previously outlined, performance expectancy is concerned with employees view on how effectively a technology can increase their performance (Venkatesh et al., 2003). In general, leaders who clarify what employees should achieve and the path to how they can achieve it, successfully drive work group effectiveness by assessing employees' needs and set clear goals (Dixon & Hart, 2010; Ogbonna & Harris, 2000). One key component of instrumental leadership is path-goal facilitation (Antonakis & House, 2014). It stems from the path-goal theory which can be understood as a process in which leaders showcase specific behaviors tailored to their employees' individual needs and their work environment with the aim of best guiding them through their work processes by removing challenges and obstacles to accomplish their working goals (Northouse, 2021). House (1996) stresses, in line with path-goal theory, that employees whose leaders approach path-goal facilitation, are more likely to show a better work performance since they are provided with guidance, have obstacles removed, and get provided with needed resources for effective performance. In the context of Industry 4.0 technology adoption, the line of reasoning goes as follows: Leaders with an instrumental leadership style provide employees the necessary guidance, resources, and information as to how to use the new technology, while at the same time set targets and identify and monitor the environment to see how the targets can be achieved with using the new technology. Consequently, employees will better understand the technology as well as how it can positively contribute to their work results, and thus they will view it as a means of improving their work performance.

Effort expectancy, as a part of the UTAUT, is about the perceived user friendliness of a certain technology. Ambiguity of usage of technology goes hand in hand with the level of user friendliness; if ambiguity is high, user friendliness is low, whereas low ambiguity ensures high user friendliness. Ambiguity can be diminished by showcasing the right leadership style. Research stresses that path-goal facilitation, which is one key component of instrumental leadership (Antonakis & House, 2014), can have both low to high effect on subordinates' motivation, depending on their level of task and role ambiguity. To disaggregate, on the one hand, subordinates who perceive their task relevant ability as high experience less ambiguity, resulting in little to no effect of superiors' path-goal facilitation. On the other hand, subordinates who perceive their task relevant ability as low are faced with high ambiguity since they lack necessary information, which consequently can be eased when leaders provide a clear direction and guidance on how to reach their working goals (House, 1996). Following this line of reasoning, leaders with an instrumental leadership style could provide employees whose task relevant

ability is low, ergo their task ambiguity is high, with guidance on how to use new technologies and remove technology-related challenges and obstacles, thereby diminishing task ambiguity, and ultimately creating a more effortless and user-friendly technology use.

The domain social influence of the UTAUT is defined as the degree to which someone believes to receive support from others (Venkatesh et al., 2003). As instrumental leadership possesses supportive aspects, for instance in form of environmental monitoring, providing necessary resources for being able to work with technology, and giving constructive feedback to improve the performance of employees, the link to social influence can be drawn. Research has shown that perceived leader support for employees and their work is created by means of progress monitoring and recognition for good work (Amabile et al., 2004), which are facets of the instrumental leadership style. Further, there is evidence that goal setting as well as constructive feedback increase employees perceived social support (Hutchison & Garstka, 1996). Employees who get supported with the environment and resources necessary for executing their work, will automatically feel the importance to use the new system.

Facilitating conditions is concerned with perceiving the right organizational and technical infrastructure exists to use the system (Venkatesh et al., 2003). In other words, to use the technology, the environment must be suitable and necessary resources must be provided. As already outlined previously, instrumental leadership is largely about monitoring the environment and providing appropriate working conditions and resources to employees to increase their performance. Therefore, the link between instrumental leadership and facilitating conditions is given. This link becomes even more evident in literature which argues that work facilitation includes elements of path-goal theory (House, 1971), and active-constructive outcome monitoring (Antonakis & House, 2013), which both are present in the sub-dimensions of instrumental leadership. Further, research stresses that the aspect of environmental monitoring is mostly missing in the transformational leadership paradigm but is vital to ensure that employees can execute their job and consequently more easily adapt to new organizational changes (Rowold, 2014). This missing connection can therefore be compensated in the instrumental leadership style. Hence, based on the literature about the four determinants of the UTAUT model, we assume that instrumental leadership might have a positive effect on performance expectancy, social influence, and facilitating condition; and a negative effect on effort expectancy, and thus, affect the Industry 4.0 technology adoption.

2.5. Emotional Intelligence

Since transformational leadership comes along with being able to motivate followers and having the ability to perceive their individual needs in times of change, as outlined previously, leaders' emotional intelligence plays an intense role in getting employees on board for the desired changes. In fact, research stresses that transformational leadership is dependent on leaders' identification of their own feelings, and understanding the feelings of others, so transformational leadership and emotional intelligence go hand in hand (Ashforth & Humphrey, 1995; Gardner & Stough, 2002; Leban & Zulauf, 2004). Emotional intelligence, which is a certain form of intelligence, has first been coined by Salovey and Mayer (1990, p. 189) as "*the ability to monitor one's own and other's feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions".* Emotional intelligence can be divided into four sub-dimensions which are: Perception and appraisal of emotions; control of emotions; understanding and reasoning of emotions; and use of emotions (Vakola et al., 2004). In particular, it was found that followers who perceive their leaders as emotionally intelligent, report less cynicism to change than those with emotionally unintelligent leaders (Ferres & Connell, 2004). One of the explaining mechanisms is the so-called Social Exchange Theory (SET), which is according to Blau (1964, p. 91-92): "the voluntary actions of individuals (that) are motivated by the returns they are expected to bring from others (with the) exact nature (of the return) never specified in advance but left to the discretion of the one who makes it". Hence, while economic exchange focuses on quid pro quo and active monitoring of transactions, social exchange is open-ended and involves greater trust and flexibility between two parties (Cropanzano et al., 2017). Specifically outlined, the three key indicators that differentiate social exchange from economic exchange are (1) trust as a basis, (2) investment in the relationship, and (3) a long-term orientation of the ongoing exchange (Blau, 1964; Eisenberger et al., 1986; Rousseau, 1995). In other words, social exchange is concerned with the socio-emotional side between one party and another (Shore et al., 2006). Following this theory, employees who perceive organizational support and valuation of their work show greater organizational commitment and favorable attitudes towards the organization (Rhoades & Eisenberger, 2002). Furthermore, Schneider and Sting (2020) found five distinct mental frames that drive employees' attitudes towards Industry 4.0 technologies. Examples are the functional frame, which means employees' perceptions are focused on the technologies' practical application and a means-end orientation, and the playful frame, which is characterized by employees' curiosity and desire to use new technologies. For employees showing the former, leaders must communicate in a manner that focuses on technical aspects and process improvements, while for employees who possess a playful frame, leaders must communicate in a manner that focuses on the fun and attractiveness aspect that the new technology implementation brings to the workplace (Schneider & Sting, 2020). In addition, as

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mentioned previously, Schneider and Sting (2020) found that different than causing either acceptance or resistance, Industry 4.0 technology implementations at the workplace can even arouse a combination of both. Those are: Emotional ambivalence, which means to have at the same time positive and negative emotions (Fong, 2006), and cognitive ambivalence, describing the situation of having at the same time positive and negative judgements (Pacilli et al., 2013). It is therefore assumed that leaders who possess a high level of emotional intelligence can easier grasp the feelings and perspectives of employees, empathize with them, understand why they feel the way they do, communicate potential benefits of the new technologies in a way that is most appealing to their mental frames, and therefore influence their views about newly implemented Industry 4.0 technology. Hence, based on the above literature, we assume that leader's emotional intelligence has a positive moderating effect on employees' perception of the domain social influence of the UTAUT and their intention to use Industry 4.0 technologies.

While leaders must possess emotional intelligence in the context of organizational changes to support their employees, likewise, employees' emotional intelligence plays a crucial role as well in the process of better adapting to a changing environment. People differ in personality traits and ergo they differ in adapting to new changes. Research conducted controlling for the variable emotional intelligence next to personality, found out that emotional intelligence, especially the sub-dimension use of emotions, explained additional variance of attitudes towards change above and beyond the effect of employee's personality traits. In fact, the effect of the use of emotions was considerably stronger than the effect of openness and agreeableness on attitudes towards change (Vakola et al., 2004). Further research found that emotional intelligence positively contributes to frontline employee adaptability, which was true for all four sub-dimensions of emotional intelligence (Sony & Mekoth, 2016). Especially in an environment where employees work together with intelligent machines and technologies, a solid base of soft skills, including emotional intelligence, is said to be required to form a well-working symbiosis between artificial and human aspects (Wilson & Daugherty, 2018). Furthermore, it was found that emotional intelligence, creativity, and proactive thinking are the top three soft skills required by employees working in an Industry 4.0 environment (Cotet et al., 2017). Additionally, multiple sources stress that emotional intelligence was significantly related to more perceived social support in the workplace (Austin et al., 2005; Gallagher & Vella-Brodrick, 2008; Schutte & Loi, 2014). Within the frame of this research, the reasoning is that high emotional intelligence employees are more aware of their own feelings and able to monitor them easier, showing their leaders that they need social support and perceiving it as such more easily. Thus, when leaders know where they can be of support for employees to better adapt to changes, eventually employees will have it easier to change their attitudes towards

the technology change once they are provided with social support. On the same line of argumentation, employees with a high level of emotional intelligence easier empathize with their team leaders and understand why they want them to use the new technology, eventually leading to less resistance. Hence, based on this argumentation, we assume that employee's emotional intelligence has a positive moderating effect on employees' perception of the domain of social influence of the UTAUT and their intention to use Industry 4.0 technologies.

3. Methodology

3.1. Research design

For this research, a mixed method case study was used as research design, including qualitative as well as quantitative data collection. While the qualitative method offers an open and flexible nature of information gathering, the quantitative method deals with numbers and figures representing people (Verhoeven, 2015). Compared to qualitative methods which are concerned with respondents' experiences and deeper meanings of phenomena, quantitative methods allow for a more efficient and broad data collection but only provide a snapshot of a phenomenon without covering in-depth perspectives (Rahman, 2016). Linking qualitative and quantitative data results in triangulation, allowing to overcome the limitations of each method by a comparison of the findings (Heale & Forbes, 2013). Furthermore, methodological triangulation yields benefits such as more comprehensive data, a better understanding of the phenomena under study, and increased validity of the research (Bekhet & Zauszniewski, 2012). Thus, this research benefits from using a mixed method since the findings will be richer in value, and eventually, practical implications are more useful and accurate. For the qualitative method, interviews were conducted with employees working in an Industry 4.0 environment. Further, surveys were as well distributed among employees working in an Industry 4.0 environment.

3.2. Sampling and sample description of qualitative and quantitative data collection

A purposive sampling strategy was followed for both the qualitative data collection (Etikan, 2016), whereas for the quantitative approach, random sampling was applied (Etikan, 2017). A company called LogistiX (pseudo-named) was chosen. The reason why this specific company was chosen is because during his time there as a Working Student, the researcher learned that their business is built upon a technology called FLOW (also pseudo-named) and TMS. The large-sized company with around 900 employees was founded in 2016 and is operating in multiple countries across the globe, with their main footprint across Europe and Asia (see, Table 1).

Table 1: General information about LogistiX.

Company	LogistiX
Industry	Logistics service provider
Size	Ca. 900
Company age	7 years
Company location	HQ in Berlin; additional office locations across Europe and Asia
Type of Industry 4.0 technology adopted	Cloud Computing, Big Data, Analytics, Smart Supply Chain, Smart Working
Interview participants	8 employees; 5 team leaders
Survey participants	30 employees; 10 team leaders

Note. The interview and survey respondents might have overlapped.

The shipping software of LogistiX consists of the in-house built Transport Management System (TMS) and FLOW which are both connected with each other. The former is the system employees work with daily, whereas the latter is the one that customers use. Employees can access FLOW as well, but customers cannot access TMS. Both make up the software of LogistiX which builds the fundament of the company's business. It was built to revolutionize the logistics industry, stepping back from a traditional, paper-based approach of handling shipments to digitizing them and becoming more efficient. The shipping software has been implemented in parallel with the start of LogistiX' foundation seven years ago and has been continuously developed by the software programmers in close accord with operations managers since then. It allows customers to digitize their logistics processes so they can track the entire supply chain in real-time and therefore make smarter business decisions. Thus, the technology is considered Industry 4.0 and thus suitable for this research. The case study focused on introducing Cloud Computing, Big Data, and Analytics, as base-technologies, and Smart Supply Chain, and Smart Working, as front-end technologies, as defined by Frank et al. (2019).

Since LogistiX' customers and employees alike deal with FLOW and TMS yet given the difficulty to get in touch with customers, it was decided to approach LogistiX' employees about their experience. This has been agreed upon in exchange with the Head of Operations with whom contact was made to initiate the connection to participants. Since he knows which employees are working with the software, he helped establishing the contact. In specific, the participants of the study involved employees from the Operations department who are working with SHIP or TMS daily and are in close contact with the company's customers, as well as managers who are working with SHIP or TMS daily and holding leadership responsibilities, acting as contact person for their subordinates. The participants' job positions ranged from Operations Specialist to Team Lead Operations and Team Lead Logistics Excellence. For the respondents of the qualitative part of this study, a purposive sampling approach was taken (Etikan, 2016; Yin & Robert K, 2011), as it was only searched for specific functions within the company, in specific for employees and team leaders who work with TMS and FLOW on a daily basis,

which resulted in the Operations department. For the survey, random sampling was applied (Etikan, 2017). Hence, everyone was sent the link to the survey multiple times, so there was no preference of one employee over another.

Employees participating in the survey had an average working time spent with the shipping software of almost 5 hours a day whereas team leaders work with it on average 4 hours a day. Genders were almost equally distributed among both employees and team leaders, with an average age of 29 years for employees and 32.5 years for team leader. Both employees and team leaders either hold a high-school degree, bachelor's degree, or master's degree. One of the employees holds a doctoral degree. The respondent's professional work experience averaged slightly more than 7 years for employees and almost 9 years for team leaders. Survey respondents included employees and team leaders from the Operations Europe department and the Operations Asia department. Interview respondents on the other hand came only from the Operations Europe department, the age ranged between 25 and 39 for employees and 27 and 32 for team leaders, and the highest educational level for employees was a master's degree while it was a Bachelor degree for team leaders. Additional information regarding survey demographics can be retrieved from table 2 and regarding interview demographics from table 3. Following the university's GDPR terms, all participants checked the first question of the survey to agree with their voluntary participation and prior to the interviews the participants signed an informed consent form, agreeing to take part in this study (cf. Appendix A for the template of the informed consent form).

Table 2: Demographics of survey respondents.

Survey respondents	Employees			Team leaders		
Demographic variables	Min.	Average	Max.	Min.	Average	Max.
Time spent working with shipping software (in hours)	1	4.81	8	2	3.96	10
Age distribution (in years)	22	29.38	55	25	32.50	39
Professional work experience (in years)	1	7.23	34	3	8.70	15
Location						
Operations Europe	22			4		
Operations Asia	8			6		
Gender						
Female	14			5		
Male	16			5		
Highest educational level						
High school degree	17			2		
Bachelor's degree	8			7		
Master's degree	4			1		
Doctoral degree	1			-		

Table 3: Demographics of interview respondents

Pseudo name	Job Title	Gender	Highest level of education
Employee 1	Operations Manager Large Cap	Male	High school diploma
Employee 2	Logistics Manager	Male	High school diploma
Employee 3	Logistics Specialist	Female	Master
Employee 4	Logistics Manager	Male	Bachelor
Employee 5	Senior Operations Specialist	Male	Bachelor
Employee 6	Senior Operations Specialist	Female	Master
Employee 7	Operations Manager Export	Male	Bachelor
Employee 8	Operations Specialist	Male	Bachelor
Team Lead 1	Team Lead Logistics Excellence	Female	High school degree
Team Lead 2	Team Lead Operations	Male	Bachelor
Team Lead 3	Team Lead Import Sea Freight	Female	Bachelor
Team Lead 4	Team Lead Operations Mid-Market	Male	High school diploma
Team Lead 5	Team Lead Operations Export	Male	Bachelor

3.3. Qualitative data collection

In total, 13 interviews were held with employees and managers of LogistiX' Europe Operations department. Due to the physical distance to the respondents, all interviews were held online. The interviews lasted roughly about 30 minutes for employees, and between 30 and 45 minutes for team leaders. All interviews were held in the time period between March 2023 and April 2023, so roughly within thirty days, to be exact. The interview guide incorporated both open-ended questions and the critical incidents technique (CIT) by Flanagan (1954). Applying the CIT enables an exploration and collection of specific and significant behaviors by asking for specific example situations, followed by a deeper dive into the matter by asking follow-up questions (Flanagan, 1954). According to Chell (2014) the CIT has the ability "to enable the researcher to focus on different forms of life, to create thick descriptions of what happens, and to thereby build and ground theory", and therefore this interview method was suitable for the exploratory nature of this research. Some of the example questions for employees included: "What Industry 4.0 related changes have you experienced at LogistiX?", "How did your direct supervisor communicate the introduction of FLOW to you? Can you give an example?", and "To what extent are you aware of your emotions towards FLOW?". Some of the example questions for direct supervisors include: "How did you impact the motivation of your employees to embrace FLOW? Can you give an example?", "How do you deal with any resistance to adopting FLOW? Can you give an example?", and "To what extent did you recognize and acknowledge the emotions of your employees in the adoption process of FLOW?". The interviews were audio recorded and then transcribed via the software Amberscript. The interview guide can be found in Appendix B.

3.4. Quantitative data collection

In the case company LogistiX, frontline employees (N=30) and managers (N=10) filled out a survey (cf. appendix B), in parallel with interviews being conducted. In this section, only the Cronbach's alpha of the combined dataset of employees and team leaders is mentioned. For reasons of simplicity, the separate Cronbach's alphas for employees and team leaders are not additionally mentioned. The only exception of mentioning separate ones is the UTAUT variables as they have only been measured for employees. For further detailed information about the separate Cronbach's alpha, please refer to table 5 and table 6. For the separate data set a few items had to be extracted since the Cronbach's alpha did not reach the critical threshold of .7. Table 5 and table 6 show which ones were removed.

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3.4.1. Survey measures

Industry 4.0 adoption. To measure the level of Industry 4.0 technology adoption, the "process-related technologies" scale by Tortorella et al. (2019) was used, including ten items. For the purpose of this research, only four of those ten were used since LogistiX offers services and those six items left out are related to Industry 4.0 in manufacturing. The four items used include e.g., "Collection, processing and analysis of large quantities of data (big data)", and "Use of cloud services associated with the product". All items were measured on a five-point Likert scale, from 1=technology is not used to 5=technology is fully adopted. The reliability analysis showed the following results: The combined data set resulted in a moderately high level of Industry 4.0 adoption with 3.584 (α=.762) (cf. table 4).

Additionally, participants were asked about the time they spend working with FLOW by incorporating the item "Average time spend on the system each day" of the use behavior scale from Venkatesh and Bala (2008) which was answered by stating the hours and minutes used.

UTAUT model. To measure the multiple aspects of employee's acceptance to Industry 4.0 technologies at the workplace, the survey from Venkatesh and Davis (2000) was used which introduced behavioural intention and all four sub-dimensions of the UTAUT model: *Behavioural Intention to use Industry 4.0 technologies* was measured with two "Intention to use" items (e.g., "Given that I have access to the system, I predict that I would use it"). Employees scored very high with a moderately high reliability (μ=6.20; α=.709) (cf. table 5). *Performance expectancy* was measured with four "Perceived usefulness" items (e.g., "Using the system improves my performance in my job"). Here, employees had a positive perception of performance expectancy, with an average of 5.817 and a high reliability level of α=.844 (cf. table 5). *Effort expectancy* was measured with four "Perceived ease of use" items (e.g., "Interacting with the system does not require a lot of mental effort."), scoring a moderately low perception of the expected effort (μ=2.50), yet the reliability level was below the critical threshold (μ=.684) (cf. table 5). *Social influence* was measured with two "Subjective norm" items (e.g., "People who influence my behavior think that I should use the system"), scoring a high average of 5.267 (α=.803) (cf. table 5). To make the questions more concrete to the situation of the respondents, the word "system" was replaced with "shipping software". This way respondents had an easier understanding about which software is meant. Examples of the adjusted survey questions are: "Given that I have access to the shipping software, I predict that I would use it" and "Using the shipping software improves my performance in my job". To measure the dimension "Facilitating conditions" this research followed the approach of Van Dun and Kumar (2023) using a composite measure of both the managerial support scale, including five items, and the organizational support scale, including three items, which measure employees' perceptions (Lukes & Stephan, 2017). An example item of the managerial support scale is: "My manager

supports me in implementing good ideas as soon as possible". And an example item of the organizational support scale is: "Our organization has set aside sufficient resources to support the implementation of new ideas". It averaged a moderately high level of 4.933 (α=.895) (cf. table 5). In addition, managerial support was also explored separately for both employees and team leaders, leading to a reliability level of α=.810 (cf. table 5), α=.833 (cf. table 6), respectively. To adjust the questions of managerial support to the team leaders, the survey questions were changed accordingly, e.g.: "I support my followers in implementing good ideas as soon as possible". All these scales were measured on a seven-point Likert scale, from 1=fully disagree to 7=fully agree.

Transformational leadership. To measure the multiple aspects of transformational leadership, the scale from (Avolio et al., 1999) was used including five sub-dimensions each with four items: *Idealized influence (Attributes)* (e.g., "My leader instills pride in me for being associated with him/her"), *idealized influence (Behavior)* (e.g., "My leader specifies the importance of having a strong sense of purpose"), *inspirational motivation* (e.g., "My leader articulates a compelling vision of the future"), *individualized consideration* (e.g., "My leader spends time teaching and coaching"), and lastly, *intellectual stimulation* (e.g., "My leader gets me to look at problems from many different angles"). Similar to the instrumental leadership questionnaire, to make it more concrete and avoid confusion about which manager is meant, the survey for transformational leadership was also adjusted from "My leader" to "My direct supervisor", e.g.: "My direct supervisor instills pride in me for being associated with him/her". Besides the third-party assessment, the survey also asked leaders for their self-assessment of transformational leadership behavior. They were adjusted to the direct superviors, exemplary items for the self-assessment would look like follows: *Idealized influence (Attributes)* (e.g., I instill pride in others for being associated with me"), *Idealized influence (Behavior)* (e.g., "I specify the importance of having a strong sense of purpose"), *Inspirational motivation* (e.g., "I articulate a compelling vision of the future"), *Individualized consideration* (e.g., "I spend time teaching and coaching"), and *intellectual stimulation* (e.g., "I get others to look at problems from many different angles"). The construct transformational leadership resulted in a positive perception for both employees and team leaders combined, averaging 5.492 (α=.965) (cf. table 4). The sub-dimensions of transformational leadership were researched for significant differences to the overall construct, yet without significant findings (cf. Appendix E). The total transformational leadership scale was measured on a seven-point Likert scale, from 1=fully disagree to 7=fully agree. Important to note is that the five sub-dimensions from Avolio et al. (1999) and the four sub-dimensions from Bass (1985) measure the same concept. Thus, Idealized influence (Attributes) and Idealized influence (Behavior) measure the concept of Bass' (1985) sub-dimension of Charismatic leadership; The sub-dimension inspirational motivation measures the sub-dimension

inspirational leadership; individualized consideration and intellectual stimulation is used by both authors.

Instrumental leadership. Instrumental leadership was measured on the 8-item scale of Antonakis & House (2014) distinguishing between the following four sub scales each including two items: *Environmental monitoring (EM)* (e.g., "My leader senses what needs to be changed in our organization"), *Strategy formulation and implementation (SF)* (e.g., "My leader translates the mission into specific goals"), *Path-goal facilitation (PG)* (e.g., "My leader removes obstacles to my goal-attainment"), and *Outcome monitoring (OM)* (e.g., "My leader assists me to learn from my mistakes"). To make it more concrete and avoid confusion about which manager is meant, the survey was adjusted from "My leader" to "My direct supervisor", e.g.: "My direct supervisor senses what needs to be changed in our organization". Besides the third-party assessment, the survey also asked leaders for their self-assessment of transformational leadership behavior. They were adjusted to the direct supervisors, exemplary items for the self-assessment would look like follows: *Environmental monitoring (EM)* (e.g., "I sense what needs to be changed in our organization"), *Strategy formulation and implementation (SF)* (e.g., "I translate the mission into specific goals"), *Path-goal facilitation (PG)* (e.g., "I remove obstacles to my followers' goal-attainment"), and *Outcome monitoring (OM)* (e.g., "I assist my followers to learn from their mistakes"). Both employees and team leaders combined had a positive perception of the instrumental leadership behavior, with an average of 5.575 (α=.921) (cf. Appendix E). Same as with the transformational leadership, the sub-dimensions of the construct were also further analyzed, yet no significant difference to the overall construct could be identified (cf. Appendix E). All scales were measured on a seven-point Likert scale, from 1=fully disagree to 7=fully agree.

Emotional intelligence. The emotional intelligence of the participants was assessed using the scale of Wong and Law (2002), distinguishing between the following four sub scales each including four items: Self-emotion appraisal (SEA) (e.g., "I have a good sense of why I have certain feelings most of the time"), Others' emotion appraisal (OEA) (e.g., "I am a good observer of others' emotions"), Use of emotion (UOM) (e.g., "I always set goals for myself and then try my best to achieve them"), and Regulation of emotion (ROE) (e.g., "I am able to control my temper and handle difficulties rationally"). Important to note is that employees and team leaders alike only assessed their own level of emotional intelligence. The combined data set averaged 5.706 (α=.840) (cf. table 4). The total emotional intelligence scale consisting of 16 items was measured on a seven-point Likert scale, from 1=fully disagree to 7=fully agree.

Demographics. Additionally, the survey also collected participant's gender, age, work experience, and educational level. The latter could be chosen between four options: High school diploma, Bachelor's degree, Master's degree, and Doctoral degree. Lastly, "Voluntariness of use of Industry 4.0 technologies" was also considered in this research as Venkatesh and Davis (2000) identified it as a key moderator in the UTAUT model. The scale included three items (e.g., "Although it might be helpful, using the system is certainly not compulsory in my job"), employees scoring a low level of voluntariness (μ=2.71; α=.741) (cf. table 5). Here, the survey questions were as well adjusted to make them more specific to the respondent, e.g.: "Although it might be helpful, using the shipping software is certainly not compulsory in my job". This scale was also measured on a seven-point Likert scale, from 1=fully disagree to 7=fully agree.

To potentially differentiate between different operating countries, the survey asked employees and team leaders in which department they are working, either in Operations Europe or Operations Asia.

3.5. Data analysis

Since this study made use of the mixed method approach of data collection, including interviews as the qualitative approach and surveys as the quantitative approach, two different types of analyses were used, which are outlined in the following.

3.5.1. Qualitative data analysis

In the qualitative data collection, it was made use of the thematic data analysis (Braun & Clarke, 2006) to extract some general theme out of the collected data, and the Gioia method to structure and report the data of the thematic analysis. So, first, following the steps of the thematic data analysis, the researcher familiarized himself with the data by reading and re-reading the interviews and making some initial notes for potential codes. Second, the initial codes were generated by highlighting valuable interview data. This is congruent with the first order concepts known from the Gioia method (Gioia et al., 2013), which was followed to create initial first order codes. This way, statements potentially relevant to the study were noted down. In this step, the researcher sticked to the words of the respondents as much as possible to avoid distorting the meaning of the interview data. The third step of the thematic analysis was searching for themes, which is congruent to the second order themes following Gioia et al (2013). This step focused the analysis at the broader level of themes, in which all first order codes were carefully examined for similarities and differences and combined to fit into an overarching second order theme. The fourth step involved reviewing the newly created second order themes and potentially rearranging them. The fifth step was to 'define and refine' the second order themes and identify the essence of them (Braun & Clarke, 2006). This step included considering each second order theme itself, as well as each second order theme in relation to the others. Based on this approach, an overarching theoretical third order theme, as discussed by Gioia et al. (2013), emerged.

The final step of the thematic analysis included telling a story of the data and thus answering the research question. The entire process of the thematic analysis and following the Gioia method was done by the researcher using an inductive approach, starting with general information which was grouped into themes and eventually arriving at theoretical concepts.

3.5.2. Quantitative data analysis

The survey data was analyzed with SPSS using simple statistics such as means and Cronbach's Alpha's reliability check, for reasons of uplifting the validity of the qualitative data and compensating for its limitations in numbers. The limitations of the survey sample size must be acknowledged and hence the conclusions must be treated with caution. In addition, the quantitative research results were checked for group mean differences between responses from employees and team leaders by conducting independent t-tests (cf. Appendix E). For two respondents of the team lead survey, all four spots for the level of technology adoption were left blank. Therefore, the mean of the other responses was taken to fill that gap. The same two respondents left blank the spot asking for the time spent with the software. Therefore, the mean of the other respondents was taken here as well. Again, the same procedure was followed with another blank spot for one question concerning the transformational leadership and for one asking for age. In addition, correlation analysis was performed to see in how far variables are correlated with each other. As the sample is very small (N=40), the data was first tested for normal distribution checking the Shapiro-Wilk test. As it turned out, some of the data was not normally distributed. For the correlation analysis, the Pearson correlation was checked for those variables that were found to be normally distributed, while the Spearman's rho correlation was performed for those variables that were found to be not normally distributed. For the independent t-test analysis, the groups of which the variables were found to be normally distributed were compared performing the Student t-test, whereas the groups with variables of non-normal distribution were compared performing the Mann-Whitney U test.

Having applied a mixed method, both the quantitative and qualitative data was integrated. In the results chapter, the quantitative data is outlined first, indicating potentially relevant correlations between the variables under study. Yet, due to the low sample size of the quantitative data (N=40), the qualitative data was taken as the guiding force, and the quantitative data served as potential support backing the findings of the interviews.

4. Results

4.1. Quantitative findings

In the following, the quantitative research results are outlined. Additionally, to the reliability analysis already outlined in the methods section, independent t-tests to compare the mean differences between employees and team leaders were conducted, and the correlation analysis between the different variables under study was performed to find potential additions.

4.1.1. Independent sample t-tests

In addition to the reliability analysis outlined in earlier chapters, independent sample t-tests were conducted to compare the following variables for employees and team leaders: *Industry 4.0 adoption; Transformational leadership as well as its individual four sub-dimensions; Instrumental leadership as well as its individual four sub-dimensions; Managerial support; and Emotional intelligence* (cf. Appendix E). For all 13 variables, the p-value was larger than the critical threshold of .05. Hence, the null hypotheses for all 13 variables cannot be rejected and therefore it can be said that there is no statistically significant difference between the means of employees and team leaders in terms of the 13 variables.

4.1.2. Correlation analysis

Furthermore, correlation analyses were performed for the different variables to see whether there is any statistically significant relationship between them. The correlation matrices for the combined dataset of both employees and team leaders, employees only, and team leaders only can be found in table 4, table 5, and table 6, respectively. In the following, the significant results are outlined.

The analysis of both employees and team leaders combined (cf. table 4) showed that TL was significantly correlated with all other variables, except I4.0 adoption. The same applies for IL and EI. This sounds counterintuitive as existing literature suggests TL, IL, and EI can positively influence I4.0 adoption.

Next, table 4 shows the correlation matrix for the employee dataset. One can see that TL is only correlated with two of the four sub-dimensions of the UTAUT model, namely with EE (r=-.599, p=<.001) and FC (r=.632, p=<.001). The same correlation applies for IL, as it is only correlated with EE (r=-.387, p=<.005) and FC (r=.744, p=<.001). Both findings are contradicting existing literature evidencing a link between TL and IL and all four sub-dimensions. Further, I4.0 adoption seems to have no significant correlation with the other researched variables as well; the only exception is effort expectancy (r=-.444,

p=<.005). Moreover, interestingly, there was no relation found between EI and SI, which contradicts existing academic findings. Yet, the dataset indicates a significant link between EI and EE (r=-.556, p=<.001) and EI and FC (r=.638, p=<.001) which has not yet been explored in the literature. Further, while UI correlates with PE, EE, and SI (r=.599, p=<.001; r=-.423, p=<.005; r=.499, p=<.005, respectively), the results indicate no correlation between FC and UI, contradicting literature again. Another interesting finding is that VL has no correlation with SI, as suggested in literature. Lastly, there is a correlation between VL and UI (r=-.484, p=<.001). Additional correlations can be retrieved from table 5.

Similar to the combined findings previously outlined, the analysis showed that TL was significantly correlated with all other variables, except I4.0 adoption. Further, both IL and EI are correlated with each variable, except MS and I4.0 adoption (cf. table 6). This again sounds counterintuitive as existing literature suggests TL, IL, and EI can positively influence I4.0 adoption.

Table 4: Correlation overview of variables by employees and team leaders combined.

	M	SD	I4.0 adoption	TL	IL	MS	EI
I4.0 adoption	3.584	3.030	(.762)				
TL	5.492	19.860	.183	(.965)			
IL	5.575	7.854	.092	.839**	(.921)		
MS	5.245	4.933	.120	.684**	.712**	(.794)	
EI	5.706	8.401	.052	.798**	.729**	.612**	(.840)

Note. ** indicates the correlation is significant at the level of .01. Further the sample size of the combined data is N=40.

Table 5: Correlation overview of variables by employees.

|	M	SD	I4.0	TL	IL	UI	MS	PE	EE	SI	FC	VL	EI
I4.0	3.658	.813	(.782)										
TL	5.435	1.092	.211	(.970)									
IL	5.558	1.076	.112	.835**	(.931)								
UI	6.200	.805	.155	.086	.193	(.709)							
MS	5.133	1.069	.190	. 696**	.752**	.077	(.810)						
PE	5.817	.902	.160	.315	.282	.599**	.295	(.844)					
EE	2.50	.801	-.444*	-.599**	-.387*	-.423*	-.399*	-.558**	(.684[a])				
SI	5.267	1.172	.173	.274	.298	.499**	.401*	.502**	-.384*	(.803)			
FC	4.933	1.103	.187	.632**	.744**	.136	.930**	.277	-.501**	.440*	(.895)		
VL	2.711	1.560	.183	.010	-.041	-.484**	-.065	-.276	.125	-.040	-.027	(.741)	
EI	5.727	.532	.170	.790**	.679**	.158	.630**	.222	-.556**	.354	.638**	-.105	(.836)

Note. * indicates the correlation is significant at the level of .05, while ** indicates the correlation is significant at the level of .01. Further, the sample size of the employee data is N=30.

[a] One item was removed: "My interaction with the shipping software is clear and understandable".

Table 6: Correlation overview of variables by team leaders.

	M	SD	I4.0 adoption	TL	IL	MS	EI
I4.0 adoption	3.360	.531	(.663[a])				
TL	5.662	.620	.220	(.935)			
IL	5.625	.661	.236	.963**	(.854)		
MS	5.580	.607	.235	.685*	.627	(.833[b])	
EI	5.644	.526	.124	.847**	.837**	.606	(.864)

Note. * indicates the correlation is significant at the level of .05, while ** indicates the correlation is significant at the level of .01. Further, the sample size of the team lead data is N=10.

[a] One item was removed: "Indicate the level of I4.0 adoption – Collection, processing, and analysis of large quantities of data (Big Data)".

[b] One item was removed: "I always financially reward my employees".

4.2. Qualitative findings

In addition to the quantitative findings of the surveys, this section of the research outlines the findings of the interviews which enrich the quantitative findings. Figure 1 shows the interview data structure based on Gioia et al. (2013), including the identified 1st-order codes and 2nd-order themes and the aggregated dimensions. Aiming to answer the research question about how transformational leadership, and instrumental leadership, combined with team leader's and employee's emotional intelligence, influence employee's adoption of Industry 4.0 technologies, the following dimensions were identified: Contextual dimension (changes within the company), the current state of employee's attitudes towards technological and organizational changes, employee and customer benefits of using TMS and FLOW, conditions for using I4.0 technology, usability of I4.0, emotional intelligence, and social influence. This section will follow the structure of these aggregated dimensions.

1st Order Concepts

- Moment of Truth technology update
- *Continuous changes in TMS and FLOW*
- *EDI transmission*
- *Employees can access FLOW as well, but customers cannot access TMS*
- *FLOW is the system customers use*
- *FLOW was built to digitize the logistics industry*
- **Integration of tracking systems such as "OceanInsights"**
- *TMS and FLOW are major technological changes*
- **TMS integration also in China**
- *TMS is the system employees use*
- *TMS was custom-built to fit LogistiX needs*

- **Adaptation to different models of transport**
- **Expanding business with different carrier suppliers to increase GP**
- **Increasing Airfreight lanes**
- **LogistiX NL becomes its own entity**
- **More departments due to transition phase**

- **Feels like people are reminiscing about the "old, certain" LogistiX**
- **Feels like people are less energized due to economic situation**
- **Last years' layoffs negatively affected culture**
- **LogistiX' maturity transition negatively affected culture**

- *Changes in TMS and FLOW are perceived positive when they make daily work easier*
- *Curious about customer feedback to new technological changes*
- *Digitizing the logistics sector is a crucial driver of change*
- *Excited and curious about new technological changes*
- *Happy with TMS and FLOW*
- **Impressed with TMS and FLOW**
- *No technology can replace human touch*
- **Open for technological changes**
- *Positive experience with TMS*
- *Sees I4.0 as helper rather than replacement*

- *Sometimes difficult to leave comfort zone for new changes*
- *Sometimes technological changes don't seem to be related to daily work*
- *TMS and FLOW are only beneficial if customers use it - not always the case*
- **TMS and FLOW have room for further development**
- *Transparency of the system will cause employees to be ready at all times*

- **Operational changes allow to receive more support**
- **Operational changes are beneficial**

- **Operational changes come too early**
- **Too many changes are demotivating**

- *EDI connection saves time for employees and customers*
- *Employees and customers save mails and time using TMS*
- **MoTs increase efficiency**
- *TMS and FLOW should improve efficiency for employees and customers*

- **Connectedness of the system allows employees to get more work done**
- *Technological changes help focus on important things*
- *TMS and FLOW create a great overview of tasks and shipment list for employees and customers*
- *FLOW offers customer to react faster to changes*
- **Customers can make changes themselves**

- **System decreases manual work**
- *TMS and FLOW create visibility for employees and customers*
- *TMS and FLOW save employees quality time they can invest in customer relations*
- *TMS prevents from making mistakes*
- *TMS and FLOW provide transparency for employees and customers*
- *FLOW improves the quality offered to the customer*
- *FLOW is the first platform that provides customers with information digitized*

- *TMS and FLOW lower tension and stress*
- *TMS is built on employees' needs*
- *TMS simplifies work*
- *FLOW makes customers feel comfortable using it*
- *FLOW offers the customer real-time data tracking of shipment*
- *Improvements in technology provide better customer experience*
- *Offer best possible customer experience*

- Buddy program for introducing new employees to TMS and FLOW
- **Media to educate employees about TMS and FLOW**
- Process team helps employees with tech issues
- Provided with everything needed to use TMS and FLOW
- Trainings for TMS changes
- **Workbook helps employees familiarize with TMS and FLOW**
- *Workshops for TMS changes*

- *Process team communicates technological changes to employees*
- *Regular one on one meetings with employees*
- *Ways for employees to inform about challenges with TMS*

- **Easy to understand**
- *Fun working with TMS*
- *TMS and FLOW are easy to handle*
- *Using TMS is comfortable*

- *TMS and FLOW are very straightforward*
- *TMS has a very intuitive touch to it*
- *FLOW has a very intuitive touch to it*

2nd Order Themes

- Technological developments
- Organizational restructuring
- Future outlook of the company
- Positive about I4.0 changes
- Negative about I4.0 changes
- Positive about general changes
- Negative about general changes
- Increase of efficiency
- Increase of productivity
- Increase of quality
- Satisfaction
- Resources for development
- Environment for development
- Ease to learn I4.0
- Intuitiveness of using I4.0

Aggregated Dimensions

- Changes within the company
- Attitude towards change
- Benefits of using I4.0
- Conditions for using I4.0
- Usability of I4.0

First-order concepts (column 1):

- **Aware of own emotions**
- Aware of own emotions towards TMS and FLOW
- *Fully aware of own emotions*
- *Quite aware of own emotions*
- *Very aware of own emotions*

⇒ **Understanding of own emotions**

- *Calm feeling towards technology*
- Good feeling towards technology
- *Feeling optimistic about new technology changes*
- *Happy about technological changes*

⇒ **Positive influence of I4.0 on emotions**

- *Demotivating if technological changes don't work out*
- *Frustrating if technological changes don't work out*

⇒ **Negative influence of I4.0 on emotions**

- *Don't let TMS affect emotions at all*
- *Don't let TMS affect emotions too much*
- *Pragmatic towards uing technology*

⇒ **Neutral influence of I4.0 on emotions**

- *Being only negative about things not working out would not solve the issue*
- *Eventually all technological changes made sense*
- **Not really open-minded sometimes**

⇒ **Self-reflection of emotions**

- Accepts if things are out of own control
- **Learned to regulate emotions**
- **Not always easy to regulate emotions**
- Separation between private mode and work mode
- Sometimes gets affected by colleagues opinions, but quickly adjusts to own feelings again

⇒ **Regulation of own emotions**

- One on one meetings make leaders recognize what is going on with employees on an emotional level
- **Recognizes employees' feelings**
- **See employees' mindset change by the impact of the changes**
- **Senses that employees' attitude shifts from negative to positive after a while**
- **Senses that employees are happy to have the chance to discuss things again**
- **Senses that it's easier for employees to say to changes**

⇒ **Recognition of others' emotions**

- **Catches up weekly about employees' feelings**
- **Delicate about employees**
- Give changes time to unfold
- **Tries to sense employees' feelings each day**
- **Tries to understand employees' sentiment**

⇒ **Effort to empathize**

These aggregate to the second-order theme: **Emotional intelligence**

- *Employees are given trust to report potential challenges with TMS*
- **Huge emphasis on team**
- Leader considers employees' opinions
- Leaders motivate employees by making them involved

⇒ **Inspirational leadership**

- *Employees feel calm when leaders clearly communicate*
- **Leader clearly communicates changes**
- *Matter of leadership communication how employees react to technological changes*
- Thorough and detailed introduction to TMS and FLOW
- **Weekly meetings to inform about new changes**

⇒ **Leader communication**

- **Leader introduces TMS and FLOW in a positive way to employees**
- **Leader shows integrity**
- **Leader tries to make employees energized about using TMS and FLOW**
- *Leaders are problem-solving oriented*
- Leaders positively affect employees' motivation to work with TMS and FLOW
- Leaders' communication positively affects employees' feelings towards TMS and FLOW
- **Leader shows employees the benefits of working with TMS and FLOW**

⇒ **Charismatic leadership**

- **Fostering self-learning in employees**
- **Fostering self-reflection in employees**
- **Giving employees the chance to ask questions about TMS (changes)**
- **Giving employees time to understand TMS (changes)**
- **Leader makes employees accountable**
- *Leader evaluates employees' performance with them*

⇒ **Encouraging leadership**

- Full support from supervisor when something is missing
- Leader acts encouraging to employees
- **Leader calms employees down**
- Leader is supportive
- **Leader listens to employees**
- Leaders are always approachable and eager to help
- *Leaders ask if employees face challenges with TMS and FLOW*
- **Leaders guide employees through TMS and FLOW**
- *Leaders help overcome challenges*
- *Leaders' guidance important for employees not to fall back into old patterns*
- *Satisfied with leader*

⇒ **Leader support**

- *Ability to influence*
- *Communicative culture*
- **Customer centric**
- *Diverse environment*
- *Employees are given responsibility*
- Employees feel involved
- *Employees get heads up introduction about new technological changes*
- **Equal treatment**
- *Informal environment*
- People are open-minded
- *Special, personal relation to customer*
- *TMS gets optimized based on employees' feedback*
- *Well-organized structure and communication*
- *Work-life balance*

⇒ **Inclusive culture**

- Employees feel as part of something bigger
- *Employees feel committed*
- *Give and get feedback*
- *People are driven by Operational Excellence*
- *People are driven by the company vision*
- **People are driven to grow**

⇒ **Growth culture**

- *People are motivating*
- **People can rely on each other**
- *Positive work atmosphere*
- *Progressive culture*

⇒ **Mutual support culture**

These aggregate to the second-order theme: **Social influence**

Figure 1. Data structure using the method following Gioia et al. (2013).

4.2.1. Changes within the company

Current changes within LogistiX identified during the interviews can be divided into three sections: Technological developments, organizational restructuring, and future outlook of the company. Organizational changes, especially when they are of technological nature, can detrimentally affect employee's technology adoption, as they must leave their comfort zone and acquire new technological savvy. Also, changes of operational nature affect employee's comfort zone alike, and might lead to demotivation, which might be affecting the willingness of adopting new technologies as well.

4.2.1.1. Technological developments

There are a variety of technological developments taking place at LogistiX. One major update mentioned several times by employees and team leaders alike were the Moments of Truth (MoTs) which is a technological advancement that offers customers more visibility and automatization about their shipping processes. Team Lead 5 recalled: *"I think the biggest implementation is just the recent one, the MoTs, so-called Moments of Truth."* Team Lead 2 clarified that this new technological development *"will allow the customer to be more informed (about their shipments) automatically speaking"*. Another big technology change is that TMS has been rolled out in Vietnam over the last year and currently *"China is also being integrated into the system"*, as Team Lead 1 addressed. Besides the big technology changes, smaller ones are continuously carried out in TMS and FLOW, such as *"the integration of tracking systems like the integration to OceanInsights and carrier websites"*, addressed by Team Lead 3, or the EDI transmission which allows *"to place bookings with the carrier without sending an email, but simply via EDI connection within our system"*, as Employee 4 noted. It becomes clear that LogistiX is adopting a variety of different technology updates which employees and team leaders alike are aware of. In later sections, it is outlined how employees adopt to and perceive those technological changes.

4.2.1.2. Organizational restructuring

Besides the technological developments, organizational changes can also potentially affect employee's sentiment towards adopting new technologies. For LogistiX, the restructuring is an important operational change that has been mentioned many times as well. Interestingly, only team leaders have been addressing this kind of change. This might be the case because team leaders have a wider view over upcoming operational changes prior to employees since they are involved in different leadership meetings. Team Lead 3 addressed that due to LogistiX' transition phase from a start-up to a global player *"there are more departments and split up work, like I said, Intermodal and FinOps."* Furthermore, Team Lead 2 recalled: *"We are adapting to different models of transport, and we are increasing our*

airfreight lanes and also, (...) in order to increase our GP on the shipments we are working since last month to now to work with different carrier suppliers." Additionally, another operational change is that *"LogistiX Netherlands now became their own entity since January"*, as Team Lead 1 stated. These operational changes give team leaders a certain feeling in terms of LogistiX future direction.

4.2.1.3. Future outlook of the company

The direction LogistiX will be heading towards has also only philosophized about from the side of the team leaders since based on their knowledge of operational changes, they have a certain opinion about its future impact. Since LogistiX has not been left unaffected by the economic situation and went through phases of unwanted layoffs, team leaders perceive a negative sentiment among employees, as Team Lead 2 stressed: *" (...) since last August or September of the last year, this turns to a more, I would say, cold environment a little bit because we are receiving more pressure, the feelings are not that "Work hard, play hard" anymore."* The mentioned transition phase also plays a huge role, as another Team Lead 4 recalled: *"(...) because everybody was so extremely happy working for LogistiX compared to when I started and open, I think nobody expects it or was able to deal with this kind of maturity change."* Team Lead 1 added: *"I have the feeling that everybody is searching, searching for something that was in the past maybe, so that everybody is not used to all these changes."* If this not so positive outlook might be holding true, this can have potential downside effects on employee's motivation, also causing resistance to adopt to the new technological changes mentioned earlier. Hence, it is a question of how leadership will deal with it accordingly.

4.2.2. Attitude towards change

Next, the attitude towards the changes could also be identified which can be divided into two sections: Attitude towards I4.0 changes and attitude towards general changes. How this relates to the Industry 4.0 adoption is quite self-explanatory. Individuals who are more motivated to use and work with the software are more likely to eventually embrace and adopt it.

4.2.2.1. Positive about I4.0 changes

Among both employees and team leaders, positive attitudes towards I4.0 could be identified. Besides being very excited about the future impact of TMS and FLOW and where it will be developing, employees and team leaders were impressed about the possibilities TMS and FLOW offer. Furthermore, using TMS and FLOW boosts employee's mood as Employee 5 recalled: *"Let's say in 90% my job totally benefits from it because it helps me updating the customers."* Employee 3 stressed: *"I'm very happy to handle the shipments via FLOW and TMS because it is the easiest tool I used in the logistics field."* The interviews evidenced a proponent attitude towards the direction of I4.0 in general. Employee 1 praised: *"LogistiX they really built something, and I would just promote this even bigger and even more because*

that can really be a change and can really drive change." Employee 5 added: "It's just like going the next step to a more digitized world." In terms of a potential threat of the I4.0 for employees, the interviews provided an overall rational attitude. Employee 3 stated that "the employee is not in danger of a technology to replace them." while Employee 5 mentioned: "I don't think that would create happy customers because customers cannot call a computer and ask for clarification. And people don't value a contact with a computer. They want to speak to someone. That's why we are there to create a bond with the customers."

These positive feelings stemmed from the continuous technological developments of the system mentioned earlier and the associated possibilities and positive perceptions for enriching the job.

4.2.2.2. Negative about I4.0 changes

On the other hand, the interviews provided some not so positive standpoints towards FLOW and TMS as well. Employee 3 criticized that changes within the system appear too regularly which forces them to change their approach of doing work as usual, making it "difficult to go out of your comfort area". She added that "sometimes the operator can have the feeling that those changes are not very related or focused on their work". The major point of critique that was mentioned from employees and team leaders alike is that TMS and FLOW have room for further improvement as "there are some things TMS is missing currently because it's not that far developed that other software are at the moment", as mentioned by Employee 4. Employee 1 stressed: "And there are a lot of features which still need to come and a lot of process automations and so on." However, even though there is room for technological improvement the participants acknowledged that LogistiX is a young company, and the system cannot be that well developed within such a short period of time. Further, Employee 7 sensed a potential downside of the transparency of the software, as he stated: "For example, in the past you had more time. (…). And nowadays, if you have an order, it must be already in the destination port, for example, you know you don't have any time anymore." One can see that such a fast technological development might also cause negative sentiment among employees.

All in all, employees and team leaders alike see the overall sentiment toward the implemented Industry 4.0 changes more as a chance rather than a hurdle and are therefore open to technology adoption. The negative aspects are just minor and can be compensated by the right role model function of the team lead.

4.2.2.3. Positive about general changes

Positive and negative sentiment towards operational changes within LogistiX could be identified as well, yet only from the team leaders. In terms of the positive sentiment, Team Lead 3 stated: "It makes our life easier, so we have more support and less work and pain points on our shoulders in the operations

team because work also increased due to Corona and the Suez Canal crisis." Also, Team Lead 2 added: *"One thing I can say is that at LogistiX all these changes are for good. But it takes time to adapt also."*

4.2.2.4. Negative about general changes

On the other hand, team leaders expressed negative sentiment towards operational changes. First, Team Lead 1 perceived some operational changes as appearing too early, as she mentioned: *"Regarding changing names, creating our LogistiX NL entity, we were not ready yet. It's an, it's again, the wrong moment that they did it in my point of view."* Team Lead 3 criticized that the number of changes at once could be overwhelming: *"I personally don't like too many changes at one time, so that's, if we have high workload and too many changes in projects, it's kind of also demotivating for the team."* The aspect of too many operational changes at once might also influence employee's motivation to adopt new technological changes in a negative way. Here, again, the role of leadership is crucial in helping counteract that negative sentiment.

4.2.3. Benefits of using I4.0

In terms of the benefits FLOW and TMS yield, the respondents came up with employee benefits and customer benefits. Such perceived benefits can crucially affect the overall Industry 4.0 technology adoption process in the following way: If employees understand that the technology can enhance their productivity, efficiency, satisfaction, and so on, they are more likely to use it than not as it makes their daily business easier. Hence, when the intention to use the technology is high, this will likely result in an overall adoption of these technologies.

4.2.3.1. Efficiency increase

The first benefit is related to efficiency. Employee 1 for instance said that "*it is convenient for everyone because you're just saving mails and saving time*". Employee 2 agreed: *"There wasn't necessarily something extra requested from my end. It's more that it was a time saver."* Team lead 1 recalled: *"To have the accurate data, meaning less checking from our side, and quicker way of working because now you have so many back and forth communication, checking with partners, but if you have like their data in our system and also the other way around, then it's really digital."* while Team Lead 3 added: *"So that makes it also a bit easier and we have less mails".* The same benefit of efficiency applies for customers as well as Team Lead 5 outlined: *"It's very good, it's great, I would say, because it makes our life easier. And so, you don't have to track your container on the websites anymore. You get the real-life data straight into our system. And the customer also gets the data directly out of our system."*

4.2.3.2. Productivity boost

Going forward, the productivity benefit was mentioned as Employee 4 recalled that TMS and FLOW *"can help us to focus on the really important things like customer service"* and Employee 7 stressed:

"You have all information and everything in one place." Employee 4 added: *"But in general, I would say that these connections can help us to focus on the really important things like customer service."* Moreover, using the system provides a better overview of the steps ahead as Employee 3 recalled: *"I can have all the shipments under control and the checklist is very useful, the checklist covers all the tasks that the operator has to do. You know what to do, the deadline, so you are able to organize your day, what to do today, tomorrow, because of course there are always incidences, issues that take time to solve them."* The same benefit of a better overview applies for the customers, as Team Lead 3 outlined: *"So, customers know where their products are and next to that we also have that order management system or we had it in the past to not only provide it based on container data, but also on product and order data, so they can act accordingly to changes."*

4.2.3.3. Improved quality

Further, the quality of work increases as the system decreases manual work which leads to making *"less mistakes then and to improve (…) work given to clients"*, as Employee 8 stressed. Employee 5 recalled: *"I think it made it a lot easier. Because it reminds you of what you need to do for each shipment so obviously in chaotic environments, people make mistakes. So, it avoids me from making mistakes because it reminds me of, hey, do this. Okay, thanks, got you, will do it. So, it made it a lot easier for me."* Team Lead 1 added: *"I think if you look at it from a compliance and risk point of view, it's really having this interface in place, it will ensure us that we are doing it correctly. And so there will be less mistakes because now there's quite often them making assumptions or thinking that we are doing it correct or saying it correct. But having this interface in place, it means that you have like a system that is thinking for you and making sure you are also alert."* For customers, the same quality benefit applies, as Employee 5 recalled: *"Let's say in 90% my job totally benefits from it because it keeps me updating the customers."*

4.2.3.4. Heightened satisfaction levels

Another benefit identified in the interviews relates to employee and customer satisfaction. Employee 3 recalled: *"TMS and FLOW contributed a lot to having a good environment because you are not stressed and angry or in a bad mood."* Giving them a feeling of ease and reduction of stress stems from the automation process of the system which takes over a lot of tasks that employees would normally do manually. Employee 3 added: *"I'm very happy using TMS because it's a very powerful tool that helps me to simplify a lot of my daily tasks (…)."* This statement serves as a great indicator of the linkage between the performance expectancy and the intention to use the software, as already found in the quantitative data collection. Furthermore, the satisfaction also stems from the system's customization to employee's needs, as Employee 1 stressed: *"So, speaking about TMS, it is really good because it is like built on the needs every operations manager has during his daily tasks."* Obviously, here the link

between perceived benefits and the intention to use the software is reflected once again. Since LogistiX is a service provider, customer satisfaction is put special emphasis on, which is reflected in the interviews as well. Employee 3 stated: *"And it's super user friendly and it's important to make the customer feel more comfortable when using the platform."* Employee 5 recalled: *"LogistiX' mission is building the backbone of logistics to serve their customers. And I think that's the main reason we want to like create order in chaos in the largest scales with all of that data, papers, etcetera. We want to make it as easy as possible for the customers."*

The positive statements about perceived benefits regarding increased efficiency, higher productivity levels, more quality, and overall work satisfaction found in the interviews underline the positive perception of performance expectancy. Furthermore, the leader behavior, which resembles the transformational and instrumental leadership, can be linked to employee's perceived benefits, as Team Lead 4 mentioned: *"So, of course, it's also my task to show new colleagues or new employees the advantage of the system."*, and Team Lead 5 stressed: *"So, I share my screen and I just show them FLOW, show them TMS, what are the advantages."*

4.2.4. Conditions for using I4.0

The interviews showed evidence for the conditions of using TMS and FLOW. The conditions are divided into two themes which are resources and environment for using the software. Being provided with the right resources and the right environment to use the new technologies is key to overcome resistance. Employees who have everything in place to work with new technologies are more likely to indeed use them than those who are missing necessary resources and environment. Thus, they will eventually be more likely adopting the new technologies if they perceive they have everything to use them.

4.2.4.1. Provided resources for using TMS and FLOW

Once new employees start at LogistiX, they are assigned a buddy who helps them familiarize with the shipping software and answer questions. The general sentiment about it is very positive, as Employee 4 stated: *"We had buddy check-ins once or twice a day, and he was just showing me the system and the ways we are able to use it."* Team Lead 5 added: *"I would say the buddy system is a very good point because there is one person you can always go to and always raise questions, knows the system and so on."* Besides the buddy program, LogistiX offers a multitude of other resources for employees such as the process team which helps with *"any major issues or problems"*, as Team Lead 4 mentioned. Additionally, Employee 2 recalled that *"trainings are scheduled where we get more in-depth explanation of how things need to operate"* while Employee 1 mentioned that *"some workshops also took place concerning small TMS changes".* Furthermore, Employee 8 stressed: *"My direct supervisor is every time there when I need help, she's really supportive with that, so if anything happens, it's, like, hard to give*

you an example of the situation, but it is like when I do have any problem and I will tell about it to my supervisor, she does everything to solve that problem." Team leaders show empathy and recognition of the things needed from employees. Their ability to empathize helps them recognize what resources employees are missing to successfully use TMS and FLOW and provide the resources accordingly, eventually improving employee's perception of facilitating conditions. Managerial support as a sub-dimension of facilitating conditions is found to be present, as previous quotes indicate. Hence, the interview data indicate a link between EI and FC.

4.2.4.2. Provided work environment for using TMS and FLOW

Besides resources, employees are also given the necessary environment for being able to successfully use FLOW and TMS. For instance, as Team Lead 5 recalled: *"I have regular one on one sessions every week with every one of my team and where we can talk about problems, what is going well, what is going not so well."* Team Lead 2 mentioned: *"But if we specify regarding the technology and TMS and so on, I use the one on ones, the weekly one on ones. So, I would say weekly."* Those meetings offer team leaders the perfect platform to find out what challenges employees face. Furthermore, Employee 5 responded: *"Sometimes if the new technologies would have any influence on our performance, then we discuss it. But if not, always discussed by the process team or sometimes even by, let's say, by our CEO or whatsoever."* For being able to do that, team leaders must possess a high level of empathy. Therefore, here again the link between managerial support, as part of facilitating conditions, and EI becomes visible. Moreover, Employee 1 responded: *"There are specific channels in Slack where you can also inform people about major issues or major bugs."*

The continuous dialogue and commitment to familiarize employees with the software boosted employees' trust in their ability to use the system which resembles the UTAUT's sub-dimension "facilitating conditions". Moreover, since a few of the resources and environment is also being provided by the team lead, it can be assumed that they are essentially responsible for employee's positive perception of facilitating conditions. Since the team leaders were found to show a lot of facets resembling the transformational and instrumental leadership style, the interviews identified a potential link between transformational leadership and facilitating conditions as well as instrumental leadership and facilitating conditions.

4.2.5. Usability of I4.0

Employees who perceive new technologies are easy to use are more likely to indeed use them than employees who experience difficulties handling them. Thus, in turn, they are also more likely to engage in Industry 4.0 technology adoption.

As previously mentioned, once a new employee starts at LogistiX, the system is introduced mostly by someone from the same team who is experienced with the system, which can be a colleague or the team lead. Employee 6 recalled: *"They basically showed me the system and showed me all the options we have and try to explain to me with practical examples, what I'm able to do with it and how we can handle shipments with it."* Further, once changes in the system are carried out employees are immediately informed by either the process team, team lead or in company-wide Zoom meetings. The thorough and detailed introduction to TMS and FLOW prepared employees to work with the system and showed them the expected effort to use it. There is clear consensus among employees about the easy and intuitive nature of the system. In terms of easiness to use, Employee 3 stated: *"And I felt from the first moment very comfortable with TMS and FLOW, really."* while Employee 2 stressed the intuitiveness of the system: *"It's very straightforward."* Employee 1 even recalled the enjoyment about working with the software: *"It really makes a lot of fun most of the times working with it."* Furthermore, besides the generally easy use of the software, a great deal is done by team leaders empathizing with employees, as Team Lead 1 addressed: *"So I'm giving them or I'm telling them how easy it is to work with our system. And sometimes when I ask them to come over to meet the team, to see if they are feeling comfortable (…), I'm also showing them our platform to make them also energized."* She added: *"So, I'm showing them the easy way of working and handling shipments."*

4.2.6. Emotional intelligence

The qualitative data also pointed to themes related to the emotional intelligence of both employees and team leaders, namely: awareness of own emotions, and awareness of other's emotions. Team lead's emotional awareness can decisively influence employee's use intention, as high level EI team leaders sense what employees are struggling with and can take respective countermeasures. Likewise, high level EI employees can easier sense their own emotions and how the new technological changes affect their sentiment. Hence, they can approach team leaders for help. Further, they can easier empathize with team leaders and understand the necessity for the new technology implementing, and thus, they might easier see the bigger picture.

4.2.6.1. Awareness of own emotions

In terms of awareness of own emotions, employees and team leaders reached consensus that they are quite till fully aware of their own emotions. However, they differed when it comes to regulating their

emotions. While Team Lead 2 stated that *"it's crazy how I can feel my emotions, but it's not that easy for me to regulate them sometimes"*, Team Lead 5 recalled: *"(…) some things happen which cannot be changed and which I cannot influence (…)."*, and Team Lead 4 said: *"Over the years, I've become quite good in getting calmer and calmer."* In addition, Team Lead 3 stated: *"I have to be open for change management. That's sometimes you just want to work in the system like it was before. And I'm not really open-minded sometimes and stressed or not aligned with any new process."* Seeing that employees and team leaders are not always open-minded, yet aware of it and willing to change this behavior indicates a great deal of emotional intelligence. Then, there is the responses of the employees. Employee 5 for instance shared the very stoic approach, recalling: *"When TMS is down and I have a lot of work, it can be a bit frustrating. But I always see that is unfortunately beyond my control."* He added: *"I always see like two versions of myself. You have the working mode, and you have the private mode."* Employee 4 recalled: *"They (colleagues) don't talk really good about TMS, it might affect my opinion for a moment. But in the end, I think I know what I should think or feel when working with it."* Moreover, Employee 3 gave the example: *"Sometimes the operator can have the feeling that those changes are not very related or focused on their work. But as with all changes at the beginning, I mean, we have to be patient and give the needed time for the changes to be established, to be improved because sometimes we can think, oh that change has nothing to do with me, you know, and, and yes, at the end it's going to help you in your daily task."* He added: *"So yeah, but as far as I know and my experience at LogistiX is that all the changes had sense."* This is another great indicator of employee's EI and hints to the aspect of empathizing. Even though employees might be hesitant in the beginning, they show a great deal of EI, trying to empathize and understand the reason why the new technology might be of good nature to improve their work, and based on this information they guide their own thinking and actions to a less resistant sentiment toward new technological changes. Such high levels of EI let them empathize with team leaders and more easily understand the necessity of using the new technological features or new ways of working. In other words, employee's emotional intelligence can potentially be linked to social influence.

4.2.6.2. Awareness of other's emotions

There is overall agreement that team leaders do a great effort to recognize employee's emotions. Team Lead 5 gave the following example: *"So, I recognize that the feeling is getting a little bit worse when you talk with him/her about TMS or FLOW. (…). So, he/she has the feeling that our department is not that important, and as I said, I'm trying to communicate. Talk to him/her and show him/her our progress where we were two years before or three years before, where no export department even existed, and where we are now with large customers and many shipments and so on (…)."* Team Lead 3 reflected about the sentiment of employees in terms of adopting to the technology: *"But I think they're always*

happy that they have the chance to discuss it again with the other departments. And I mean, we have a lot of surveys and so on, so LogistiX tries to listen to the employees and operations managers." Moreover, the individual consideration of employees becomes visible, as Team Lead 2 recalled: *"So, I try to understand their points and ask about their opinion and also translate this point to the other departments related."* He even went more in-depth, stressing that *"the main point for me on this job and this leadership position is my team and their opinion."*

Besides the recognition of other's emotions, team leaders take a caring approach and really make an effort to empathize with employees. Team leaders are being delicate about their team, as Team Lead 2 recalled: *"First I tried to understand their point. (…) my thought of leadership is not an imposition. So, I try to understand their points and ask about their opinion and also translate this point to the other departments related."* Team Lead 4 addressed how to deal with resistance: *"So, of course, in the beginning talking to them, finding out what are the issues here. Why is he or she resistant to use it or not feeling safe enough in using it."* This is a critical statement which perfectly indicates the link between team lead's emotional intelligence and social influence as team leaders want to understand why employees act resistant to using the software and how they can change their sentiment. Essentially, team leaders try to empathize regularly, as Team Lead 2 mentioned: *"I use the one on ones, the weekly one on ones."* It becomes clear that employees as well as team leaders perceive a great degree of EI.

4.2.7. Social influence

This section outlines the concept of social influence, sub-divided into the two sections leadership behavior and organizational culture since both resemble social influence. Each of those two is again sub-divided into different leadership behaviors shown by team leaders and deeper laying cultural aspects of the broader organizational culture scheme. In the following, these are addressed. First, employees who perceive social influence is high, meaning they receive social support and sense that team leaders and co-workers want them to engage in new technologies, are more likely to use them, and, in turn, adopt to new Industry 4.0 technologies. Second, leader behavior might have a big effect on employee's intention to use the new technologies, as they are responsible for motivating them to engage in the new technology and guiding them through the new adoption process.

4.2.7.1. Leadership behavior

4.2.7.1.1. Inspirational leadership

Conducting the interviews, several leadership behaviors could be identified. These are addressed in the following:

First, employees and team leaders alike reached consensus that leaders consider employee's opinion. Employee 3 recalled: *"He takes into account not only my opinions, but all my team's opinions."* Team Lead 5 said: *"And I think this will also motivate the employees to be more positive about TMS when they take part of the development."* This individual consideration gives employees a feeling of valuation and appreciation, as Employee 5 recalled feeling very involved. Involvement is of huge importance since *"they are not only following instructions, but they are part of the process and the creation of it"*, as Team Lead 2 highlighted. Employee 5 stressed: *Yeah, well, she made me feel very let's say involved because she, as far as I know, the communication is very transparent."* Hence, team leaders and employees encounter each other on eye-level, showcasing inspirational leadership. Both individual consideration and inspirational leadership are sub-dimensions of the transformational leadership model. Therefore, the interviews indicate that team leaders show facets of that type of leadership.

4.2.7.1.2. Clear leader communication about the software

Moreover, employees value the clear communication throughout the adoption process to TMS and FLOW but also far beyond. Employee 7 stressed: *"This kind of tool was new for me. So, she has introduced it to me in a positive way and showed me all the functions, etcetera, but also with the information that there is still work on it."* Additionally, even beyond the initial introduction, the communication is present during *"weekly meetings where we are talking about new rollouts and also about maybe issues"*, as team Lead 4 stressed. Scanning the environment for potential challenges and providing needed resources to overcome them resembles one of the subdimension of the instrumental leadership model. Thus, the interviews yield evidence that team leaders show facets of the instrumental leadership style. This regular clear communication and elimination of hurdles obviates potential sources of stress, as Employee 2 stressed: *"It just gives a nice calm feeling when we're all, I guess, in the same boat and head in the same direction."*

4.2.7.1.3. Charismatic leadership

In addition, the adopted leadership style is characterized by charismatic facets. For instance, leaders positively affect employee's feelings towards TMS and FLOW by talking positively about it and therefore also energizing them, as Employee 3 recalled: *"It (the communication) affects me in a very positive way."* Team Lead 1 puts huge importance on showing integrity as she mentioned: *"I think sometimes they are a little bit annoyed because I'm always really positive. But to be honest I think if I'm disagreeing with the changes, then they will know it's for real, right? So, and I think that's the feedback I'm also receiving."*

Moreover, another quote resembling the charismatic leadership was mentioned by Employee 2: *"And if the direction is clear, then of course it gives you a better feeling of where we're heading in the right direction."* These findings resemble showing integrity and considering the group as most important, providing employees a clear vision of the future, and stimulating employees to look at challenges from different perspectives, which all resemble the transformational leadership style.

4.2.7.1.4. Encouraging leadership

Also, leaders put huge emphasis on the personal development of employees, as employee 5 recalled: *"We talk about performance related topics."*, which resembles the outcome monitoring aspect of the instrumental leadership style. Leaders want employees to foster self-learning and self-reflection, as Team Lead 1 mentioned: *"Giving them also the feeling that they are accountable for their own actions, but also making sure they search for the root cause."* They also want to make sure to *"not make them anyhow biased against the system"*, as Team Lead 4 stressed, because they want employees to keep an individual and critical mindset. This focus on accountability and critical thinking resembles the sub-dimension intellectual stimulation of the transformational leadership style.

4.2.7.1.5. Leader support

In case employees need help or face challenges, leaders ensure their support and encouragement at any time. This is the consensus among interviewed employees. Further, employees perceive leaders as approachable and *"always willing to help"*, as Employee 6 mentioned. Not only do they react but they are also proactively *"asking on a constant basis if there are any pain points (…) with TMS"*, as Employee 1 recalled. This resembles the aspect of environmental monitoring. Team leaders add that it is important for them to calm employees down in the face of challenges and listen to them to find out what they are struggling with. This act of empathizing resembles leader's emotional intelligence. Additionally, when they introduce TMS and FLOW (changes), they take employees by the hand and guide them through all steps to make sure they understand everything. Employee 4 stated: *"There's one customer who is really asking a lot of questions and always expecting us to have a great overview of what we are currently working on for him. At the beginning I thought it was really difficult to match his needs and then my supervisor showed me a way how we can create reports in FLOW."* This is a perfect example for team lead's path-goal facilitation. Team Lead 2 mentioned: *"One of my team members sometimes forgets to upload some documents, some customs document, and I saw them, one example of what is the consequence, and there was a customer that couldn't see the documentation, so I told them, please always you receive this documentation, upload it, because otherwise the customer is going to ask you the documents by email. And this way you're avoiding more emails in your inbox. So, if this customer proactively received download this documentation, please do it because you are after all*

reducing your manual work. You are doing it in advance.”, which is a great example of strategy formulation. These interview findings resemble the instrumental leadership style.

4.2.7.2. Organizational culture

The interviews indicated three parts of the organizational culture, which can be labelled as: Inclusive culture, growth culture, and mutual support culture. Besides the leadership behavior, the interaction among employees plays a big part of the social influence aspect of the company as well. If employees feel their co-workers support them in using the software, they are more inclined to use it as well because of the social support they receive.

4.2.7.2.1. Inclusive culture

First, the inclusive culture is characterized by an informal environment, a feeling of involvement and equal treatment as employees get responsibility and *“have the possibility to influence things”*, as Employee 2 noted. One example that was given by many employees is them having a say in the development of TMS, as Employee 4 recalled: *“I really like working with TMS because it’s very well built and it’s getting constantly optimized, based on our feedback, and based on what we are providing as feedback to the IT team.”* Furthermore, employees are informed immediately when new changes in TMS and FLOW take place. In general, LogistiX consists of a very diverse workforce which makes them *“very open-minded, which helps (…) to understand different points of views and different points of views in different departments, which is very important.”*, as Employee 6 mentioned. In addition, clear communication does not only play a role for leaders and employees, but throughout all levels of the organization, as Employee 7 mentioned: *“And also how they communicate with the employees is much better than in other companies. (…) it’s more personal.”*

4.2.7.2.2. Growth culture

Second, LogistiX is characterized by an environment that puts huge emphasis on personal growth. Through informing employees about latest changes within the organization, LogistiX increases their commitment towards the company which *“makes people feel like they are really a part of something they never experienced before”*, as Employee 5 mentioned. This bounds employees to the company, and they can more likely identify with it. Further, employees are very driven by the company’s vision and operational excellence, focusing on getting better and better every day. Team Lead 3 mentioned that employees are *“always going forward”*, so they have true willingness to grow and learn. This growth mindset is supported by the feedback culture, as Employee 2 mentioned: *“I’m aware the leadership is open for feedback where you can also give it.”*, resembling the outcome monitoring aspect of the instrumental leadership.

4.2.7.2.3. Mutual support culture

Third, there is the mutual support culture. The interviews indicated that both employees and team leaders alike perceive a positive work atmosphere. People are very motivating, and they can count on each other. Team Lead 5 stated: *"So, the culture, the most important value, in my opinion for the culture is "We are one". So, we are a team. So, everyone is jumping in for the other one, helping each other out whenever they can (…), and no one gets left alone."* Team Lead 4 mentioned: *"So best example, for example, the value "we are one". So, in case someone is sick or not there and the team steps together in order to get the tasks of the colleague done. We also had some busier times last year in summer where we had way to less people. And no one was there saying, okay, no, I'm not stepping out. I have no time to support you. So, we sit here as a team together until evening to get everything done."*

Through means of different positive leadership behaviours and a positive organizational culture that both are focused on the development of the employees, it can be said that social influence was found in the interviews and therefore they hint at a potential link as leaders are a big part of the social influence domain and both facets of transformational and instrumental leadership were present in the data collection. Hence, by means of motivating and encouraging employees to use the software while at the same time guiding them through the different steps, employees will perceive the necessity of using the system, which resembles social influence.

5. Discussion

Using a mixed method case study, this research explored how certain leadership styles combined with leader's and employee's emotional intelligence influence employee's adoption of Industry 4.0 technologies, and ultimately Industry 4.0 technology use behavior. Albeit high levels of employee's intention to use the Industry 4.0 technology and moderately high levels of its true adoption levels were found, plus high level evidence of the four sub-dimensions constituting the UTAUT model, they were not the only predecessor predicting employee's user intentions of Industry 4.0 technologies. In light of the inductive nature of this research (Gioia et al., 2013), the findings expand the existing UTAUT model as they suggest a possible moderating effect of employee's and team lead's emotional intelligence on the link between the UTAUTS's dimension social influence and employee's intention to use Industry 4.0 technologies. In addition, the team leaders participating in the study showed a leadership style akin to the transformational and instrumental leadership. Hence, this research considers those two leadership styles as crucial antecedents of the UTAUT model, eventually influencing the overall Industry 4.0 adoption. In the following section, the reasoning behind the premises is elaborated.

5.1. Theoretical contributions

Firstly, since the UTAUT model considers only the individual-level adoption of the employee, while it leaves out external support, the role of leadership has been one of the focal points of this research. In specific, transformational leadership is suggested to make an addition to the enablers of employee's I4.0 technology adoption (Seyal, 2015; Van Dun & Kumar, 2023). Previous literature identified charismatic leadership as an antecedent of all four sub-dimensions of the UTAUT (Neufeld et al., 2007; Van Dun & Kumar, 2023). Charismatic leadership is a sub-dimension of transformational leadership that relates to arousing employee's enthusiasm, loyalty, faith, pride, and trust in leader's abilities (Bass, 1985). Therefore, it has been assumed that transformational leadership shows a similar effect. Indeed, the research evidenced a positive effect. Besides charismatic leadership, as identified in the qualitative and quantitative analysis, leaders aroused employee's motivation to work with TMS and FLOW (inspirational leadership), considered employee's individual needs and opinions (individual consideration), and fostered employee's self-learning and critical thinking abilities (intellectual stimulation). The behavior of the team leaders might indeed have contributed to employee's positive attitudes towards the adoption of TMS and FLOW. Similar to the evidence provided in previous literature (Dong et al., 2007; Schepers et al., 2005), the qualitative data evidence a positive effect of transformational leadership on employee's performance expectancy as well as addressed in the results section (cf. 4.2.3.4. Heightened satisfaction levels). However, the quantitative analysis did not find a statistically significant correlation between transformational leadership and performance expectancy of the UTAUT model. This sounds counterintuitive since one might assume that leaders who display a high level of transformational leadership might increase employee's perception of expected benefits of the I4.0 technology, as also found in the qualitative data set. Yet, since the quantitative data set is very small, the findings of the interviews are the ones setting the tone.

Furthermore, the team leader behavior might also have led to more clarification in terms of the system's easiness to learn and use. Indeed, the qualitative data set indicates a potential link between transformational leadership and effort expectancy. By means of motivating and energizing employees and letting them be actively involved in the process of shaping the system, they will be more motivated to engage in using the system and have a better understanding of how the system works, thus, perceiving it as less difficult to use. Even though the quantitative data for effort expectancy resulted in a reliability just below the critical threshold, it can be assumed that it is still reliable given the positive perception of employees in terms of the effort expectancy found in the interviews as we treat the interviews as guiding force. Moreover, the statistically significant correlation between TL and EE (cf. table 4) found in the quantitative data support the qualitative findings. These solid findings point to a strong link between transformational leadership and effort expectancy which is congruent with the

research of Schepers et al. (2005) who connected transformational leadership with perceived ease of use, which equals the UTAUT's sub-dimension effort expectancy.

In addition, the team leaders in the qualitative sample show supportive behavior to employees and make sure they are provided with the necessary conditions to successfully use TMS and FLOW, may it be workshops, clear communication, or regular meetings which reflects the UTAUT's dimension social influence. In other words, by motivating and encouraging employees and considering them individually, employees will perceive the necessity to use the system. As team leaders show facets of the transformational leadership, the link can be drawn between transformational leadership and social influence, as existing literature shows (Cho et al., 2011; Lyons & Schneider, 2009). Yet, there was no statistically significant correlation found between transformational leadership and social influence in the quantitative data. Facing the literature, this seems counterintuitive. However, it could again very well be that no correlation was found due to the limited sample size; yet since the interviews are setting the tone, this study indicates a potential correlation between transformational leadership and social influence.

Lastly, building on the JD-R theory (Bakker & Demerouti, 2007), literature suggests that transformational leadership can shape employee's individual perceptions of work and diminish job demands and provide resources needed (Fernet et al., 2015). Indeed, it was found that team leaders provided employees with information about TMS and FLOW and the needed assistance in form of resources, such as workshops and buddies, as well as environment, such as regular one on one meetings. Therefore, they increased job resources and decreased job demands. Hence, the displayed transformational leadership might have positively influenced the sub-dimension facilitating conditions as existing literature shows (Young, 2020). The quantitative data set supports the qualitative findings as it indicates strong reliability and correlation between the two variables. Thus, the following statement is proposed:

Proposition 1 a. Leader's transformational leadership style has a) a positive influence on employee's perception that using the I4.0 technology will yield higher performance benefits; b) a positive influence on employee's perception of social influence, eventually leading to employee's I4.0 technology acceptance.

Proposition 1 b. Leader's transformational leadership style has a) a strong negative influence on employee's perception of the expected effort to use the system; b) a strong positive influence on employee's perception that the necessary resources and environment to use the I4.0 technology will be provided, eventually leading to employee's I4.0 technology acceptance.

Transformational leadership as an antecedent of the UTAUT covers the external role of leaders in the process of technology adoption only partly. While it covers the motivational and encouraging impact, it leaves other aspects largely unaddressed. Hence, besides the transformational leadership, another leadership style must be considered. In their paper, Antonakis and House (2013) proposed the need for a fuller full range leadership model. Hence, additionally to the well-researched and evidence-based transformational leadership theory, they propose an instrumental leadership theory which makes up the strategic and task-monitoring related actions which the transformational leadership model is largely missing. While the construct of instrumental leadership has been subject to a multitude of research papers, academia was not yet able to link it to the UTAUT model in the field of technology adoption. This research is therefore the first to find evidence for a potential effect of instrumental leadership on variables of the UTAUT model and employee's technology adoption.

The qualitative data shows that the interviewed team leaders in the sample scanned the environment and provided employees with resources needed to use TMS and FLOW (environmental monitoring), formulated objectives (strategy formulation), identified tasks and provided the resources to fulfill them (path-goal facilitation), and reflected on employee's performance and giving feedback (outcome monitoring). As leaders guide employees through the system and show them potential benefits it yields, employees will perceive them as such. This type of leadership might have well contributed to employee's positive perception of the adoption of TMS and FLOW Therefore, the qualitative data evidence a positive effect of instrumental leadership on employee's performance expectancy as addressed in the results section (cf. 4.2.7.1.5. Leader support). The quantitative findings however only indicate a high reliability level but no correlation, yet because of its small sample size, the qualitative data is treated as the guiding force.

Similar to House (1996) who found that providing a clear direction and guidance, resembling path-goal facilitation, can decrease task ambiguity and make work clearer and more straightforward, the qualitative findings indicate a link between instrumental leadership, including the aspect of path-goal facilitation House (1996) was referring to, and effort expectancy. Participants talked about continuous meetings between employees and team leaders in which they address potential issues about using the system and find ways to fix them. Further, they are introduced and guided through new updates within the system which positively affects their perception of the ease of using the system. Indeed, the quantitative data supports the qualitative findings, as it also indicates a correlation between instrumental leadership and effort expectancy.

Building on research by Hutchison and Garstka (1996) who suggest that setting goals and giving feedback, which are aspects of instrumental leadership, can increase employee's perceived social

support, the research indicates similar results. The interview participants mentioned several times team leader's willingness to guide and support employees through the system. This makes employees feel the need that team leaders want them to use the system and the given social support. Thus, the qualitative findings suggest a link between instrumental leadership and social influence. Yet, the quantitative findings only indicate a high reliability but no correlation. As with previous findings, the qualitative findings are treated as the driving force.

Lastly, the research evidenced a link between instrumental leadership and facilitating conditions. Work facilitation includes facets of path-goal theory (House, 1971), and outcome monitoring (Antonakis & House, 2013), both resembling aspects of the instrumental leadership theory. Building on this literature, the qualitative findings indicate a link between instrumental leadership and facilitating conditions as by means of continuous meeting about new system updates, team leaders become aware of what potential resources and environment employees are missing to successfully adapt to the new technological changes. This finding is supported by the quantitative findings, both reliability as well as correlation wise. Based on these findings, the following statement is proposed:

Proposition 2 a. Leader's instrumental leadership style has a) a positive influence on employee's perception that using the I4.0 technology will yield higher performance benefits; b) a positive influence on employee's perception of social influence, eventually leading to employee's I4.0 technology acceptance.

Proposition 2 b. Leader's instrumental leadership style has a) a strong negative influence on employee's perception of the expected effort to use the system; b) a strong positive influence on employee's perception that the necessary resources and environment to use the I4.0 technology will be provided, eventually leading to employee's I4.0 technology acceptance.

Thirdly, the findings address the topic of how to deal with employee's emotions related to Industry 4.0 adoption. Working in an environment where interacting with technology plays a big role, a certain degree of emotional intelligence is said to be a precondition of successful adaptation (Wilson & Daugherty, 2018). Indeed, literature shows that employees who possess a high level of emotional intelligence find it easier to adapt to changes at the workplace (Sony & Mekoth, 2016). Likewise, employees who perceive their managers have a high degree of emotional intelligence are less cynical about changes (Ferres & Connell, 2004). Manager's emotional intelligence can increase employee's commitment and favorable attitudes towards the organization (Rhoades & Eisenberger, 2002). This is rooted in the motivational aspect of the social exchange theory (SET), which builds on trust, investment

in a relationship, and a long-term orientation of the ongoing exchange rather than a quid pro quo relationship (Blau, 1964; Eisenberger et al., 1986; Rousseau, 1995). The unconditional support of the team leaders might show employees that they are cared about which might boost the already existing motivational determinants of employees to accept (technological) changes. The part of manager's emotional intelligence playing a role here is concerned with their ability to recognize employee's emotions towards the technological change and act accordingly to help regulate them. Since the social exchange theory is primarily concerned with the relationship between team lead and employee, it is expected that the role of manager's emotional intelligence primarily affects the UTAUT's softer variable social influence in relation to employee's intention to use the software. When employees feel that team leaders care about them and they are treated with respect rather than with focus on the economic exchange only, they are more likely to recognize the social influence and want to give back in form of embracing the new technological changes. Indeed, the qualitative findings indicate a link between manager's emotional intelligence and social influence as team leaders empathize with and support them to find out what they are struggling with in terms of the system, while the quantitative findings indicate a high reliability of the construct emotional intelligence but no correlation between the two variables. The qualitative approach is again treated as the driving force.

While the construct of emotional intelligence has been subject to a multitude of research papers, academia was not yet able to link it to facilitating conditions of the UTAUT model in the field of technology adoption. This research is therefore the first to find evidence for a potential effect of emotional intelligence on facilitating conditions of the UTAUT model and employee's technology adoption since the qualitative and quantitative findings show a potential link between manager's emotional intelligence and facilitating conditions. As the interview data indicate, high emotional intelligence team leaders are more likely to have an open ear for employees, listening to them in regular one on one meetings and beyond, providing the needed environment for them to talk about challenges regarding the new technological changes. Empathizing in those conversations, high emotional intelligence team leaders are more likely to sense the needed resources employees are missing and eventually more likely to provide them, so employees will be less resistant to adopt the new technology changes. Hence, the following statement is proposed:

Proposition 3 a. Leader's emotional intelligence has a) a positive influence on employee's perception of social influence, eventually leading to employee's I4.0 technology acceptance.

Proposition 3 b. Leader's emotional intelligence has a) a strong positive influence on employee's perception that the necessary resources and environment to use the I4.0 technology will be provided, eventually leading to employee's I4.0 technology acceptance.

In line with literature suggesting that emotional intelligence is significantly related to more perceived social support in the workplace (Austin et al., 2005; Gallagher & Vella-Brodrick, 2008; Schutte & Loi, 2014), the qualitative findings show that employees who are reflective about their initially hesitant outlook on new technology changes, become more willing to understand the reason of the new technology implementation, and hence, they become more receptive to social support. The quantitative data however did not find a correlation between emotional intelligence and social influence. Yet, as the qualitative data is treated as guiding force, the link between those variables can still be drawn.

Again, academia was not yet able to link emotional intelligence to facilitating conditions of the UTAUT model in the field of technology adoption. This research is therefore the first to find evidence for a potential effect of emotional intelligence on facilitating conditions of the UTAUT model and employee's technology adoption. The support and provision of necessary resources, resembling facilitating conditions, require a certain level of self-awareness of employee's own emotions and a level of empathy towards others in order to know how to approach for help. Hence, since a high degree of employee's emotional intelligence is present in the interview data set, a potential link between employee's emotional intelligence and facilitating conditions can be drawn from the qualitative findings. The quantitative findings support the qualitative data as they also found a correlation between the two variables. Hence, the following statement is proposed:

Proposition 4 a. Employee's emotional intelligence has a) a positive influence on employee's perception of social support, eventually leading to employee's I4.0 technology acceptance.

Proposition 4 b. Employee's emotional intelligence has a) a strong positive influence on employee's perception of facilitating conditions, eventually leading to employee's I4.0 technology acceptance.

Although the original moderator "voluntariness of use" is said to positively affect the intention to use the system, the research findings turned out differently. Indeed, the interviewed employees mentioned that their voluntariness to use TMS and FLOW is very low since the system is a critical part of their daily work and they must use it anyway. Yet, their intention to use the system turned out to be very high.

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Comparing these findings with the initial hypothesis of Venkatesh et al. (2003), these findings seem to be counterintuitive. For there might be other underlying mechanisms at play that offset the negative connotation of the low voluntariness, such as the perceived benefits or easiness to use the system. Hence, this moderating variable is kept in the conceptual model and future research with similar case studies is needed to be able to draw valid conclusions.

Based on these propositions previously elaborated, the following conceptual model was proposed for future research:
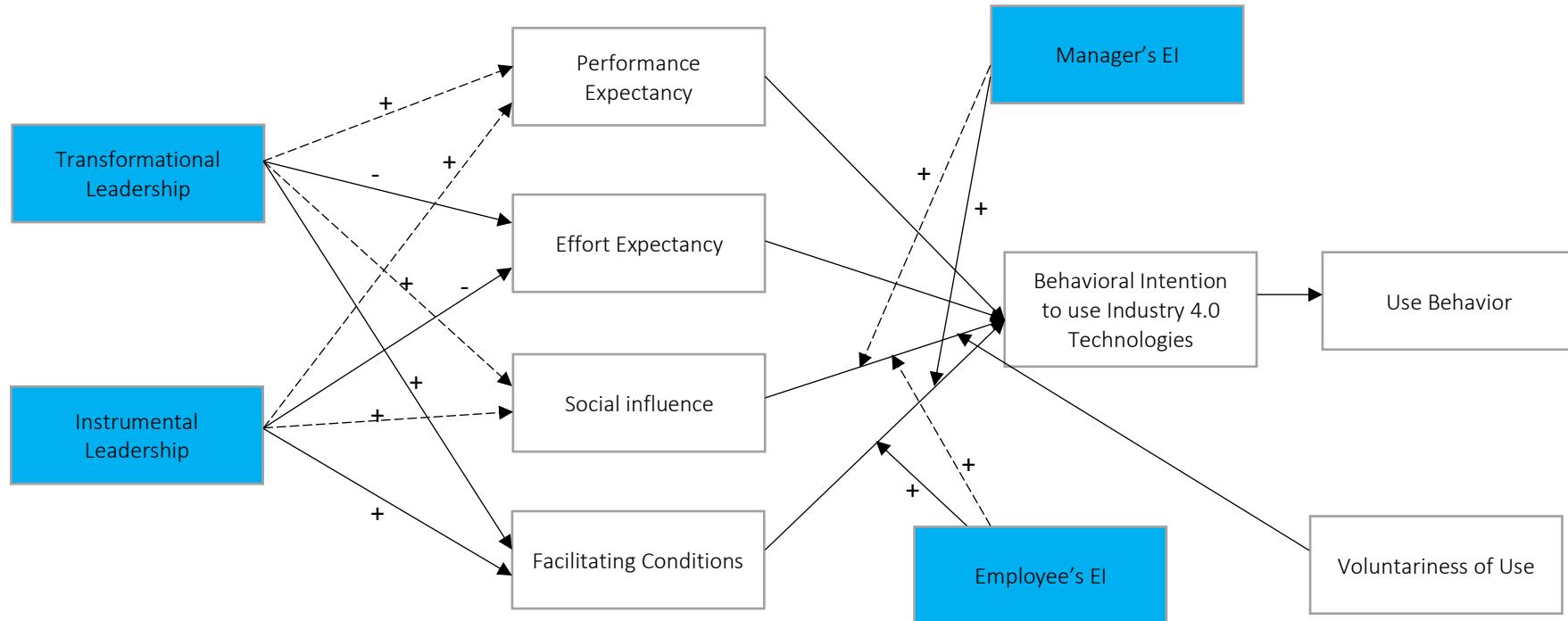
Figure 1: Conceptual model of the enablers of Industry 4.0 technology adoption

Note. The light blue variables were added to the existing UTAUT model by Venkatesh et al. (2003); solid arrows indicate a link found in both qualitative and quantitative data, while dashed arrows indicate a link found in qualitative data only.

5.2. Practical implications

This study highlights the important role team leaders hold in supporting employees to successfully adapt to an Industry 4.0 technology related workplace. Specifically, team leaders are advised to integrate four types of transformational leadership behavior, which are: (1) showing their integrity of their words and actions (charismatic leadership); (2) communicating a compelling vision of the direction the new Industry 4.0 technologies might take within the company (inspirational motivation); (3) considering employee's individual needs, abilities, and aspirations in the adoption process of the new technology (individualized consideration); and (4) inviting employees to actively shape the implementation process of the new technologies (intellectual stimulation).

Additionally, team leaders are advised to integrate four types of instrumental leadership behavior, which are: (1) scanning the internal and external environment, understanding constraints, and providing employees with appropriate resources (environmental monitoring); (2) designing strategies and setting objectives with employees (strategy formulation and implementation); (3) removing challenges employees face and guiding them along the way to effective performance (path-goal facilitation); and (4) observing employee's performance and giving constructive feedback (outcome monitoring).

The digital transformation of organizations begins with being embedded in the organizational strategy and needs to be communicated by team leaders among employees. On the one hand, team leaders need to make sure to motivate, encourage, and enthuse employees about using the new Industry 4.0 technology (motivational aspect), while at the same time ensuring guidance, setting goals, and providing resources to them (practical aspect). It is pivotal that besides the top-down approach, which is important for communicating and pushing a vision, the active participation in the transformation process is not neglected since it is decisive for ensuring employee's acceptance (Hartl, 2019). Such a bottom-up approach could be realized by adjusting the organizational culture to one that puts huge emphasis on employee involvement and inclusion, mutual support, and focus on individual growth, as present in the case of LogistiX. This way, while a strong vision from management is communicated top-down, employees still can actively participate in and shape the technology adoption process. Research even proves that the role of organizational culture is by no means undecisive in influencing the digital transformation transition of organizations (Saarikko et al., 2020). In fact, the attitude towards rather than the access to technology is pivotal to successful adoption to technology change (Kane et al., 2015). Thus, organizations must especially emphasize organizational culture and employee involvement rather than technological savviness.

Building on the importance of having a suitable organizational culture, communication from team leaders across employees plays a decisive role, too. There is strong academic evidence that clear communication is an antecedent of creating trust (Thomas et al., 2009). More specifically, the authors found that quality of information raised trust of one's co-workers and supervisors, and adequacy of information raised trust in top management. On the one hand, quality of information relates to information from co-workers and supervisors that is in time, accurate, and relevant. Adequacy of information, on the other hand, relates to top management setting direction, shaping the purpose, and overseeing general organizational processes. Yet, information from top management is rarely specific to employee's individual jobs. Therefore, supervisors are integral to communicate top management's abstract information into relevant and task-related information. Hence, the role of supervisors is a central one in ensuring employee's trust in both supervisors as well as top management. This trust increases employee's perception of organizational openness, which, in turn, makes employees more involved in organizational goals (Thomas et al., 2009). Since in the Industry 4.0 context the organizational goals are strongly related to employees using certain types of technologies, clear communication from supervisors can massively affect the overall Industry 4.0 technology adoption. As the role of supervisor communication is highlighted, organizations are advised to put special attention on a clear communication practice stemming from supervisors among employees. First, they must make sure to avoid providing employees with irrelevant, inaccurate, and untimely information to prevent being overwhelmed and confused. Likewise, supervisors should translate the information coming top-down from management into concrete information, so employees know how it relates to their daily tasks.

One critical factor found multiple times throughout the qualitative findings is the significance of leader's managerial support and emotional intelligence. While the aspect of employee's technological savvy must not be left unaddressed, it is equally important for organizations to have leaders who are able to sense the socio-emotional needs of employees regarding the technology adoption process. In fact, emotional intelligence can even be a precursor of the correct provision of needed conditions. The study revealed that high level emotional intelligence team leaders had an easier time empathizing with employees and sensed which resources they needed to successfully remove hindrances to employee's technology adoption. Likewise, the interview findings suggest that employee's level of emotional intelligence also plays a huge role in the successful technology adoption as they recognize what challenges there are and what they might need to overcome them. Therefore, organizations are advised to draw attention to increasing team lead's as well as employee's emotional intelligence. This can be realized by means of workplace learning interventions, such as trainings, which are proven to increase

both awareness of own and other's emotions (Nelis et al., 2009). Additional research evidence the effectiveness of training interventions to increase one's emotional intelligence (Hodzic et al., 2018; Schutte et al., 2013). While it is advised to perform the training sessions over a long-term period for optimum benefit, even training people short-term was found to improve their emotional intelligence (Nelis et al., 2009). Specifically, it is advised that besides the emotional intelligence trainings organizations develop individualized training interventions concerning technology knowledge (Boothby et al., 2010), as present in the case of LogistiX to fit the individual needs and challenges of employees.

As an organization's human capital is the number one source of competitive advantage, organizations should start looking for talent right from the beginning of the employee journey. As recruiting the right people can save the company a lot of time and money, since the recruited talent needs less additional training, organizations and its human resource department should look for talented individuals that combine both a sophisticated savvy of the latest Industry 4.0 technologies and a high degree of emotional intelligence (Srinivasan et al., 2020). This applies for employees and team leaders alike, as the former are more likely to sense the urgency and the reason to participate in the digital transformation phase, and the latter are more likely able to communicate the vision and guide employees along the way.

6. Strengths, limitations, and future research suggestions

Having applied the mixed method, combining the qualitative approach in form of interviews with the quantitative approach in form of surveys, increased the overall validity of the research by allowing to overcome the limitations of each method. Further, the case study incorporates respondents from a variety of countries, including Germany, Vietnam, and Poland which all have a masculine culture (Hofstede, 2011; Nasierowski & Mikula, 1998; Onishi & Bliss, 2006). Although masculine cultures tend to be less open about feelings (Hofstede, 2011), the findings evidence a great extent of emotional intelligence, which increases the generalizability of the findings. Even though limitations remain, the findings pointed to new avenues of investigation that will enhance academia's and management's understanding of enablers of a successful adoption of new Industry 4.0 technologies.

While participants from the Operations Asia department were present in the quantitative data collection, the qualitative data collection only had participants coming from the Operations Europe department. This could have distorted the reliability of the findings when cross-comparing interviews and surveys. Moreover, the sample size of the quantitative data collection was low which also could have negatively affected the overall reliability of the findings. Hence, the propositions raised earlier

must be taken with a dose of caution and it is in the hands of future research to replicate the research with a bigger sample to increase reliability.

Since the investigated case study is a fairly young company, where the Industry 4.0 adoption is in an early stage, future research may explore later stages Industry 4.0 technology adoption. This way, it helps understand the different leadership and emotional mechanisms playing a role in a well-established, top-down environment, different to the very open and participative one present in the case study.

While this research is built on the UTAUT and TAM2 model, during the literature review for this study the UTAUT2 and TAM3 model emerged. The UTAUT model was specifically chosen as Venkatesh et al. (2003) evidenced that it explained 70 percent of the variance in user intentions to use information technology and outperformed other technology acceptance models. In view of the digital transformation, the UTAUT2 and the TAM3 model incorporate relevant variables such as user's hedonic motivation, habit, computer self-efficacy, computer anxiety, and computer playfulness (Venkatesh et al., 2012; Venkatesh & Bala, 2008). These variables could potentially be valuable additions to the overall technology acceptance model and could potentially offer further explanations towards employee's intention to use Industry 4.0 technologies and their Industry 4.0 technology acceptance. Academics are invited to consider these variables in future research to get a more sophisticated understanding of the technology adoption process.

7. Conclusion

As the UTAUT model was proven multiple times to be a reliable indicator of individual's internal factors determining their technology adoption, the aim of this study was to also consider external factors potentially influencing individual's technology adoption as well. Transformational and instrumental leadership styles were investigated as antecedents of the four UTAUT dimensions. Additionally, the role of leader's emotional intelligence as well as employee's own emotional intelligence were investigated as a potential moderator of the UTAUT's four sub-dimensions. This left the study with the aim of answering the following research question:

"How do transformational and instrumental leadership, combined with leaders' and employees' emotional intelligence, affect employees' adoption of Industry 4.0 technologies in the logistics sector?"

This study showed a potential link between transformational leadership and two of the UTAUT's sub-dimensions. In specific, transformational leadership has a positive link with performance expectancy and social influence, while it has a strong negative link with effort expectancy and a strong positive link with facilitating conditions. Instrumental leadership was found to have the same positive link with performance expectancy and social influence and the same strong negative link with effort expectancy and strong positive link with facilitating conditions. Moreover, both leader's and employee's emotional intelligence were found to have a potential positively moderating effect with the UTAUT's sub-dimensions social influence and a potential positively strong moderating effect with facilitating conditions.

In the world of technological progress, it cannot be relied only on employee's ability to cope with technology resistance as the social role of leaders and their emotional intelligence can decisively influence individual technology adoption as well. If organizations put the technology adoption in the hands of the employees only, they might miss out on the chance to getting employees on board for digital transformation as they ignore valuable external socio-emotional factors that can crucially help employees to adapt to technological changes and navigate them through the sea of digital transformation.

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Appendices

Appendix A: Informed consent form

Informed consent form for the interview with Jerome Manko for his master's thesis

<u>Information sheet</u>

Dear participant,

Thank you for enriching my master's thesis by participating in this interview. This information sheet briefly introduces the topic and the purpose of the research.

Industry 4.0 refers to the intelligent networking of machines and processes for industry with the help of information and communication technology. The implementation of Industry 4.0 technologies in the workplace can bring a variety of benefits, but it also poses a number of challenges for employees. To address both sides of the coin, this research examines the role of leadership in relation to employees' possible concerns, and how this relates to the adoption of Industry 4.0 technologies on the work floor. The goal is to understand how leaders can best support employees to adapt and thrive in this novel environment.

I want you to know that there are no risks known to us associated with the research study, for it has been reviewed and approved by the BMS Ethics Committee / domain Humanities & Social Sciences. Your audio-recorded answers in this study will remain confidential. The data will only be accessible by myself (Jerome Manko) and my two supervisors Dr. Desirée van Dun and Dr. Lara Carminati. We will minimize any risks of third-party usage by safely storing the data only and exclusively in the encrypted University of Twente database. For data protection purposes, your personal interview data along with the ultimate research findings of the interviews will be anonymized. All audio recordings collected throughout the period of data collection will be deleted right after the finalization of the research project.

Please note that your participation in this study is entirely voluntary and you can withdraw at any given time. You are free to omit any questions you do not feel convenient to answer.

You have the right to request access to, rectify, and erase your personal data at any given time.

As mentioned previously, your personal data will be anonymized and only then stored in the University of Twente data storage. Hence, in the case of possible publishing the outcomes, no personal data whatsoever will be disseminated.

In case certain details remain unclear, you can email me and my supervisors anytime under the following contact details:

Jerome Manko (<u>j.manko@student.utwente.nl</u>)
Desirée van Dun (<u>d.h.vandun@utwente.nl</u>)
Lara Carminati (<u>l.carminati@utwente.nl</u>)

Contact Information for Questions about Your Rights as a Research Participant

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee/domain Humanities & Social Sciences of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by **ethicscommittee-hss@utwente.nl**

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Please tick the appropriate boxes   **Yes   No**

Taking part in the study

I have read and understood the study information dated DD.MM.YYYY, or it has been read to me. I have   □   □
been able to ask questions about the study and my questions have been answered to my satisfaction.

I consent voluntarily to be a participant in this study and understand that I can refuse to answer   □   □
questions and I can withdraw from the study at any time, without having to give a reason.

I understand that taking part in the study involves an interview that is audio-recorded via the video   □   □
communications software Zoom. Afterwards, the collected data of the interview will be transcribed in
text format. The transcripts will be anonymized, and the audio recordings will be deleted right after the
finalization of the master's thesis.

Use of the information in the study

I understand that information I provide will be used, of course anonymized, for reports, data archives,   □   □
or publications available to the University of Twente.

I understand that personal information collected about me that can identify me, such as e.g., my name   □   □
or my demographics, will not be shared beyond the research team.

I agree that my information can be quoted in research outputs under a pseudo-name without revealing   □   □
my identity.

Consent to be audio-recorded

I agree to be audio-recorded.   □   □

Future use and reuse of the information by others

I give permission for the pseudo-named anonymized transcripts that I provide to be archived in the   □   □
encrypted and secured UT server so it can be used for future research and learning.

Signatures

_____   _____   _____
Name of participant [printed]   Signature   Date

I have accurately read out the information sheet to the potential participant and, to the best of my
ability, ensured that the participant understands to what they are freely consenting.

_____   _____   _____
Researcher name [printed]   Signature   Date

Study contact details for further information: Jerome Manko, j.manko@student.utwente.nl

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Appendix B: Semi-structured interview guide

The interview starts with an informal chat about the shipping software which the interviewees use. The use of this software is the main subject of the interview. In addition, the data collection consent-form is addressed which has been signed by the interview beforehand. The reason for the prior signature is that all interviews take place virtually via Zoom.

For employees

Introduction

1. Could you please shortly introduce yourself and your position within the organization?
2. How would you describe the organization in general, the type of service it offers, and the organizational culture?

General organizational questions

3. Which (technological) changes were implemented in the organization in the past years?
4. How do you typically respond to change within your organization? Why?

Industry 4.0-related changes

5. What change has the company experienced regarding Industry 4.0 technology adoption?
6. Why were these technological changes implemented?

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7. How did these changes affect your job or you personally?
8. Could you perceive any benefits of the newly implemented change? If so, what are those?

Leadership behavior

9. How did your direct supervisor communicate these changes to you?
10. How did the communication of your direct supervisor affect your feelings about these changes?
11. To what extent do you feel empowered or motivated by your direct supervisor to embrace the changes? Give an example.
12. To what extent do you feel provided with the right resources and environment by your direct supervisor to successfully adapt to the changes?

Emotional intelligence

13. How did the change affect your emotions?
14. To what extent are you aware of your emotions in general?
15. To what extent are you aware of your emotions towards the change?

Closing

16. Is there anything you would like to discuss regarding the Industry 4.0 technology adoption?

Ending statement

Thanks for the interview, I appreciate your time. The interview will be transcribed anonymously and if you feel like you have forgot to mention an important point, please don't hesitate to reach out to me via j.manko@student.utwente.nl.

For direct supervisors

Introduction

1. Could you please shortly introduce yourself and your position within the organization?
2. How would you describe the organization in general, the type of service it offers, and the organizational culture?

General organizational questions

3. Which (technological) changes were implemented in the organization in the past years?
4. How do you typically respond to change within your organization? Why?

Industry 4.0-related changes

5. What change has the company experienced regarding Industry 4.0 technology adoption?
6. Why were these technological changes implemented?

Leadership behavior

7. How did you communicate these changes to your employees?
8. How did your communication affect the feelings of your employees about these changes?
9. To what extent are you empowering or motivating your employees to embrace the changes? Give an example.
10. To what extent are you providing your employees the right resources and environment to successfully adapt to the changes?

Emotional intelligence

11. How did the change affect your emotions?
12. To what extent did you recognize and acknowledge the emotions of your employees?
13. How did you act upon their emotions?
14. How did your response affect them?

Closing

15. Is there anything you would like to discuss regarding the Industry 4.0 technology adoption?

Ending statement

Thanks for the interview, I appreciate your time. The interview will be transcribed anonymously and if you feel like you have forgot to mention an important point, please don't hesitate to reach out to me via j.manko@student.utwente.nl.

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Dear participant,

Thank you for participating in this survey. Please let me give you a short introduction into the topic first.

Industry 4.0 refers to the intelligent networking of machines and processes for industry with the help of information and communication technology. The implementation of such smart technologies in the workplace may have various benefits, but might also pose challenges for employees. To address both sides of the coin, this research examines the role of leadership in relation to employees' feelings, and how this relates to the adoption of smart technologies on the work floor. The goal is to understand how leaders can best support employees to adapt and thrive in this novel environment.

This survey will take approximately 5-10 minutes of your time. Before you start this survey, it is important that you read the information below.

1. You have, at any time, the possibility to withdraw from the survey.
2. The data is strictly confidential and the results will be processed anonymously.
3. The data will be used for academic purposes only.
4. The data will only be accessible by the research team which consists of myself Jerome (MBA student) and my two supervisors at the University of Twente. No one within Forto will learn about your answers to this survey, which will remain confidential.
5. Data will be saved on the encrypted and secured UT server and will not be shared with other parties.

If you have any more questions, please don't hesitate to contact me: j.manko@student.utwente.nl

I've read the information mentioned above and I understand that my results will be confidentially used for academic purposes only. Therefore, I will voluntarily agree to participate in this survey.

◯ Yes, I voluntarily agree

◯ No, I don't agree

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The first section is about Industry 4.0 technology adoption. Please indicate the level of Industry 4.0 technology adoption at your organization.

	technology is not used	technology is barely used	technology is somewhat used	technology is largely used	technology is fully adopted
Remote monitoring and control of production through systems such as manufacturing Execution System and Supervisory Control and Data Acquisition	○	○	○	○	○
Collection, processing, and analysis of large quantities of dat (Big Data)	○	○	○	○	○
Use of cloud services associated with the product	○	○	○	○	○
Incorporation of digital services into products (Internet-of-Things or product Service Systems)	○	○	○	○	○

On average, how much time do you spend on the shipping software every day? Please indicate hours and minutes.

[   ]

This next section is about your assessment of your direct supervisors' leadership. Please answer the questions.

My direct supervisor...

	fully disagree	disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree	fully agree
...instills pride in me for being associated with him/her.	○	○	○	○	○	○	○
...talks about their most important values and beliefs.	○	○	○	○	○	○	○
...talks optimistically about the future.	○	○	○	○	○	○	○
...spends time teaching and coaching.	○	○	○	○	○	○	○
...re-examines critical assumptions to question whether they are appropriate.	○	○	○	○	○	○	○
...goes beyond self-interest for the good of the group.	○	○	○	○	○	○	○
...specifies the importance of having a strong sense of purpose.	○	○	○	○	○	○	○
...talks enthusiastically about what needs to be accomplished.	○	○	○	○	○	○	○
...treats me as an individual rather than just as a member of a group.	○	○	○	○	○	○	○
...seeks differing perspectives when solving problems.	○	○	○	○	○	○	○

My direct supervisor...

	fully disagree	disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree	fully agree
...acts in ways that builds my respect.	○	○	○	○	○	○	○
...considers the moral and ethical consequences of decisions.	○	○	○	○	○	○	○
...articulates a compelling vision of the future.	○	○	○	○	○	○	○
...considers me as having different needs, abilities, and aspirations from others.	○	○	○	○	○	○	○
...gets me to look at problems from many different angles.	○	○	○	○	○	○	○
...displays a sense of power and confidence.	○	○	○	○	○	○	○
...emphasizes the importance of having a collective sense of mission.	○	○	○	○	○	○	○
...expresses confidence that goals will be achieved.	○	○	○	○	○	○	○
...helps me to develop my strengths.	○	○	○	○	○	○	○
...suggests new ways of looking at how to complete assignments.	○	○	○	○	○	○	○

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This next section is also about your assessment of your direct supervisors' leadership. Please answer the questions.

My direct supervisor...

	fully disagree	disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree	fully agree
...understands the constraints of our organization.	○	○	○	○	○	○	○
...ensures that his/her vision is understood in specific terms.	○	○	○	○	○	○	○
...removes obstacles to my goal attainment.	○	○	○	○	○	○	○
...assists me to learn from my mistakes.	○	○	○	○	○	○	○
...senses what needs to be changed in our organization	○	○	○	○	○	○	○
...translates the mission into specific goals.	○	○	○	○	○	○	○
...ensures that I have sufficient resources to reach my goals.	○	○	○	○	○	○	○
...provides me with constructive feedback about my mistakes.	○	○	○	○	○	○	○

Please indicate your level of technology adoption by answering the following questions.

	fully disagree	disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree	fully agree
Assuming I have access to the shipping software, I intend to use it.	○	○	○	○	○	○	○
Using the shipping software improves my performance in my job.	○	○	○	○	○	○	○
My interaction with the shipping software is clear and understandable.	○	○	○	○	○	○	○
People who influence my behavior think that I should use the shipping software.	○	○	○	○	○	○	○
My manager motivates me to come to him/her with new ideas.	○	○	○	○	○	○	○
Using the shipping software in my job increases my productivity.	○	○	○	○	○	○	○
Interacting with the shipping software does not require a lot of my mental effort.	○	○	○	○	○	○	○
My manager always financially rewards good ideas.	○	○	○	○	○	○	○
My manager supports me in implementing good ideas as soon as possible.	○	○	○	○	○	○	○
My manager is tolerant of mistakes and errors during the implementation of something new.	○	○	○	○	○	○	○

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Please continue to indicate your level of technology adoption by answering the following questions.

	fully disagree	disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree	fully agree
Given that I have access to the shipping software, I predict that I would use it.	O	O	O	O	O	O	O
Using the shipping software enhances my effectiveness in my job.	O	O	O	O	O	O	O
I find the shipping software to be easy to use.	O	O	O	O	O	O	O
People who are important to me think that I should use the shipping software.	O	O	O	O	O	O	O
My manager is able to obtain support for my proposal also outside our department.	O	O	O	O	O	O	O
I find the shipping software to be useful in my job.	O	O	O	O	O	O	O
I find it easy to get the shipping software to do what I want it to do.	O	O	O	O	O	O	O
The way of remuneration in our organization motivates employees to suggest new things and procedures.	O	O	O	O	O	O	O
Our organization has set aside sufficient resources to support the implementation of new ideas.	O	O	O	O	O	O	O
Our organization provides employees time for putting ideas and innovations into practice.	O	O	O	O	O	O	O

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This section concerns your voluntariness to use the technology at work. Please indicate it by answering the following questions.

	fully disagree	disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree	fully agree
My use of the shipping software is voluntary.	O	O	O	O	O	O	O
My supervisor does not require me to use the shipping software.	O	O	O	O	O	O	O
Although it might be helpful, using the shipping software is certainly not compulsory in my job.	O	O	O	O	O	O	O

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In this section, please indicate your way of dealing with your own and others' feelings by answering the following questions.

	fully disagree	disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree	fully agree
I have a good sense of why I have certain feelings most of the time.	○	○	○	○	○	○	○
I always know my friends' emotions from their behavior.	○	○	○	○	○	○	○
I always set goals for myself and then try my best to achieve them.	○	○	○	○	○	○	○
I am able to control my temper and handle difficulties rationally.	○	○	○	○	○	○	○
I have good understanding of my own emotions.	○	○	○	○	○	○	○
I am a good observer of others' emotions.	○	○	○	○	○	○	○
I always tell myself I am a competent person.	○	○	○	○	○	○	○
I am quite capable of controlling my own emotions.	○	○	○	○	○	○	○

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Please continue to indicate your way of dealing with your own and others' feelings by answering the following questions.

	fully disagree	disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree	fully agree
I really understand what I feel.	O	O	O	O	O	O	O
I am sensitive to the feelings and emotions of others.	O	O	O	O	O	O	O
I am a self-motivated person.	O	O	O	O	O	O	O
I can always calm down quickly when I am very angry.	O	O	O	O	O	O	O
I always know whether or not I am happy.	O	O	O	O	O	O	O
I have good understanding of the emotions of people around me.	O	O	O	O	O	O	O
I would always encourage myself to try my best.	O	O	O	O	O	O	O
I have good control of my own emotions.	O	O	O	O	O	O	O

There are only a few steps left before we near the end of the survey. The final steps are concerned with some last personal information. Again, I want you to know that all given answers will be kept confidentially and your demographics will be used for purposes of this research only. Please finalize the survey by answering the last questions.

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What is your gender?

○ Male
○ Female
○ Non-binary / third gender
○ Prefer not to say

What is your age?

What is your highest level of education?

○ High school diploma (Abitur)
○ Bachelor's degree
○ Master's degree
○ Doctoral degree

In what department are you operating?

○ Operations Asia
○ Operations Europe

Is there anything else you would like to share about the adoption of Industry 4.0 technologies in your organization?

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Thank you for your time spent taking this survey.
Your response has been recorded.

In case you have questions, please reach out to me via j.manko@student.utwente.nl

Appendix D: Survey for team leaders

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Dear participant,

Thank you for participating in this survey. Please let me give you a short introduction into the topic first.

Industry 4.0 refers to the intelligent networking of machines and processes for industry with the help of information and communication technology. The implementation of such smart technologies in the workplace may have various benefits, but might also pose challenges for employees. To address both sides of the coin, this research examines the role of leadership in relation to employees' feelings, and how this relates to the adoption of smart technologies on the work floor. The goal is to understand how leaders can best support employees to adapt and thrive in this novel environment.

This survey will take approximately 5-10 minutes of your time. Before you start this survey, it is important that you read the information below.

1. You have, at any time, the possibility to withdraw from the survey.
2. The data is strictly confidential and the results will be processed anonymously.
3. The data will be used for academic purposes only.
4. The data will only be accessible by the research team which consists of myself Jerome (MBA student) and my two supervisors at the University of Twente. No one within Forto will learn about your answers to this survey, which will remain confidential.
5. Data will be saved on the encrypted and secured UT server and will not be shared with other parties.

If you have any more questions, please don't hesitate to contact me: j.manko@student.utwente.nl

I've read the information mentioned above and I understand that my results will be confidentially used for academic purposes only. Therefore, I will voluntarily agree to participate in this survey.

○ Yes, I voluntarily agree
○ No, I don't agree

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This next section is about Industry 4.0 technology adoption. Please indicate the level of Industry 4.0 technology adoption at your organization.

	technology is not used	technology is barely used	technology is somewhat used	technology is largely used	technology is fully adopted
Remote monitoring and control of production through systems such as manufacturing Execution System and Supervisory Control and Data Acquisition	○	○	○	○	○
Collection, processing, and analysis of large quantities of dat (Big Data)	○	○	○	○	○
Use of cloud services associated with the product	○	○	○	○	○
Incorporation of digital services into products (Internet-of-Things or product Service Systems)	○	○	○	○	○

On average, how much time do you spend on the shipping software every day? Please indicate hours and minutes.

[   ]

This next section is about your self-assessment of your leadership. Please answer the following questions.

	fully disagree	disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree	fully agree
I instill pride in others for being associated with me.	○	○	○	○	○	○	○
I talk about my most important values and beliefs.	○	○	○	○	○	○	○
I talk optimistically about the future.	○	○	○	○	○	○	○
I spend time teaching and coaching.	○	○	○	○	○	○	○
I re-examine critical assumptions to question whether they are appropriate.	○	○	○	○	○	○	○
I go beyond self-interest for the good of the group.	○	○	○	○	○	○	○
I specify the importance of having a strong sense of purpose.	○	○	○	○	○	○	○
I talk enthusiastically about what needs to be accomplished.	○	○	○	○	○	○	○
I treat others as individuals rather than just as a member of a group.	○	○	○	○	○	○	○
I seek differing perspectives when solving problems.	○	○	○	○	○	○	○

Please continue to indicate your leadership by answering the following questions.

	fully disagree	disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree	fully agree
I act in ways that build others' respect for me.	○	○	○	○	○	○	○
I consider the moral and ethical consequences of decisions.	○	○	○	○	○	○	○
I articulate a compelling vision of the future.	○	○	○	○	○	○	○
I consider an individual as having different needs, abilities, and aspirations from others.	○	○	○	○	○	○	○
I get others to look at problems from many different angles.	○	○	○	○	○	○	○
I display a sense of power and confidence.	○	○	○	○	○	○	○
I emphasise the importance of having a collective sense of mission.	○	○	○	○	○	○	○
I express confidence that goals will be achieved.	○	○	○	○	○	○	○
I help others to develop their strengths.	○	○	○	○	○	○	○
I suggest new ways of looking at how to complete assignments.	○	○	○	○	○	○	○

\#

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This next section is also about your self-assessment of your leadership. Please answer the following questions.

	fully disagree	disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree	fully agree
I understand the constraints of our organization.	○	○	○	○	○	○	○
I ensure that my vision is understood in specific terms.	○	○	○	○	○	○	○
I remove obstacles to my followers' goal attainment.	○	○	○	○	○	○	○
I assist my followers to learn from their mistakes.	○	○	○	○	○	○	○
I sense what needs to be changed in our organization.	○	○	○	○	○	○	○
I translate the mission into specific goals.	○	○	○	○	○	○	○
I ensure that my followers have sufficient resources to reach their goals.	○	○	○	○	○	○	○
I provide my followers with constructive feedback about their mistakes.	○	○	○	○	○	○	○

Please indicate the following questions about your leadership towards your employees.

	fully disagree	disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree	fully agree
I motivate my followers to come to me with new ideas.	○	○	○	○	○	○	○
I always financially reward good ideas.	○	○	○	○	○	○	○
I support my followers in implementing good ideas as soon as possible.	○	○	○	○	○	○	○
I am tolerant of mistakes and errors during the implementation of something new.	○	○	○	○	○	○	○
I am able to obtain support for my followers' proposal also outside our department.	○	○	○	○	○	○	○

In the next section, please indicate your way of dealing with your own and others' feelings by answering the following questions.

	fully disagree	disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree	fully agree
I have a good sense of why I have certain feelings most of the time.	○	○	○	○	○	○	○
I always know my friends' emotions from their behavior.	○	○	○	○	○	○	○
I always set goals for myself and then try my best to achieve them.	○	○	○	○	○	○	○
I am able to control my temper and handle difficulties rationally.	○	○	○	○	○	○	○
I have good understanding of my own emotions.	○	○	○	○	○	○	○
I am a good observer of others' emotions.	○	○	○	○	○	○	○
I always tell myself I am a competent person.	○	○	○	○	○	○	○
I am quite capable of controlling my own emotions.	○	○	○	○	○	○	○

Please continue to indicate your way of dealing with your own and others' feelings by answering the following questions.

	fully disagree	disagree	somewhat disagree	neither agree nor disagree	somewhat agree	agree	fully agree
I really understand what I feel.	○	○	○	○	○	○	○
I am sensitive to the feelings and emotions of others.	○	○	○	○	○	○	○
I am a self-motivated person.	○	○	○	○	○	○	○
I can always calm down quickly when I am very angry.	○	○	○	○	○	○	○
I always know whether or not I am happy.	○	○	○	○	○	○	○
I have good understanding of the emotions of people around me.	○	○	○	○	○	○	○
I would always encourage myself to try my best.	○	○	○	○	○	○	○
I have good control of my own emotions.	○	○	○	○	○	○	○

There are only a few steps left before we near the end of the survey. The final steps are concerned with some last personal information. Again, I want you to know that all given answers will be kept confidentially and your demographics will be used for purposes of this research only. Please finalize the survey by answering the last questions.
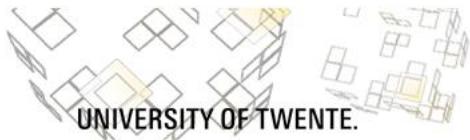
What is your gender?

- ○ Male
- ○ Female
- ○ Non-binary / third gender
- ○ Prefer not to say

What is your age?

[   ]

How many years of professional work experience do you have?

[   ]

What is your highest level of education?

- ○ High school diploma (Abitur)
- ○ Bachelor's degree
- ○ Master's degree
- ○ Doctoral degree

In what department are you operating?

- ○ Operations Asia
- ○ Operations Europe

Is there anything else you would like to share about the adoption of Industry 4.0 technologies in your organization?

[   ]
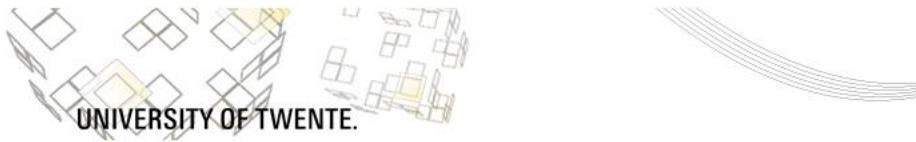
Thank you for your time spent taking this survey.
Your response has been recorded.

In case you have questions, please reach out to me via j.manko@student.utwente.nl

Appendix E

Table. Reliability overview of measured variables by employees, team leaders, and both combined, extended by sub-dimensions for transformational and instrumental leadership.

Variable (number of final items)*	Employees only			Team leaders only			Employees and team leaders combined		
	α	M	σ	α	M	σ	α	M	σ
Industry 4.0 adoption (4)	.782	3.658	.81337	.621	3.360	.53062	.762	3.584	3.0306
Transformational leadership (20)	.970	5.435	1.09246	.935	5.662	.61994	.965	5.492	19.86
Charismatic leadership (8)	.948	5.496	1.14116	.869	5.529	.65928	.935	5.504	8.271
Inspirational leadership (4)	.895	5.508	1.10929	.826	5.750	.60093	.886	5.569	4.019
Individualized consideration (4)	.787	5.275	1.22887	.114	5.750	.54006	.747	5.394	4.443
Intellectual stimulation (4)	.837	5.400	1.07599	.885	5.750	.87401	.843	5.488	4.120
Instrumental leadership (8)	.931	5.558	1.07666	.854	5.625	.66144	.921	5.575	7.854
Environmental monitoring (2)	.527	5.633	1.05808	.571	5.700	.48305	.524	5.65	1.884
Strategy formulation (2)	.798	5.467	1.10589	.762	5.400	.96609	.786	5.450	2.122
Path-goal facilitation (2)	.876	5.467	1.23130	.454	5.550	.79757	.815	5.488	2.259
Outcome monitoring (2)	.822	5.667	1.32179	.718	5.850	.91439	.802	5.713	2.448
Intention to use I4.0 (2)	.709	6.200	.80516	-	-		-	-	
Managerial support (5)	.810	5.133	1.06911	.682	5.580	.607	.794	5.245	4.933
Performance expectancy (4)	.844	5.817	.90242	-	-		-	-	
Effort expectancy (4)	.660	2.50	.80140	-	-		-	-	
Social influence (2)	.803	5.267	1.17248	-	-		-	-	
Facilitating conditions (8)	.895	4.933	1.10335	-	-		-	-	
Voluntariness (3)	.741	2.711	1.56036	-	-		-	-	
Emotional intelligence (16)	.836	5.727	.53197	.864	5.644	.52626	.840	5.706	8.401

*Note. The variable *Industry 4.0 adoption* was measured on a 5-point Likert scale while all other variables were measured on a 7-point Likert scale.

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Table. T-tests for mean group comparison of employees and team leaders.

Variable	Employees & team leaders (mean group comparison) Significance (2-tailed)
Industry 4.0 adoption	.123
Transformational leadership	.794
Instrumental leadership	.842
Managerial support	.272
Emotional intelligence	.670
Charismatic leadership	.656
Inspirational leadership	.701
Individualized consideration	.379
Intellectual stimulation	.315
Environmental monitoring	.866
Strategy formulation	.818
Path-goal facilitation	.747
Outcome monitoring	.770

Note. The significance level used is .05.

Appendix F

Table. Exemplary quotes from the qualitative data collection, with description, and 2nd order themes.

Exemplary quotes	Description	2nd order theme
"Well, LogistiX decided we have a certain moment of truth" (Employee 5)	Quotes that give insights into the most recent technological developments within LogistiX.	Technological developments
"So what I can say is the biggest innovations or the biggest new features are the EDI transmission so that we are able to place bookings with the carrier without sending an email, but simply via EDI connection within our system." (Employee 4)		
"So now our TMS is getting rolled out in China. It's already rolled out in Vietnam since I think eight months. So, that's of course one big development which we made during the last three years." (Team Lead 4)		
"Operational wise we are adapting to different models of transport." (Team Lead 2)	Quotes that give insights about the most recent organizational changes within LogistiX.	Organizational restructuring
"In order to increase our GP on the shipments we are working since last month to now to work with different carrier suppliers." (Team Lead 2)		
"So, there are more departments and split up work like I said, intermodal, finops. So, the finance department process teams global but also in Germany." (Team Lead 3)		
"I think the changes compared to last year and now I think it's different. I feel there's less positive energy. I think within the whole organization. I think especially because we are changing so quick in the processes, but also in the setting, becoming a global player instead of local. I have the feeling that everybody's searching, searching for something that was in the past maybe, so that everybody is	Quotes that provide thoughts about a possible future direction of LogistiX.	Future outlook of the company

not used to all these changes." (Team Lead 1)		
"And when I joined LogistiX, everything was just like a honeymoon, I would say. Everything was going so well. Everyone was so happy. The last year was actually quite tough with COVID and so on." (Team Lead 5)		
"But the vibes are different because you can see that the situation is not that easy. It's not that happy economically speaking." (Team Lead 2)		
"I'm very happy to handle the shipments via FLOW and TMS because it's the easiest tool I used in logistics." (Employee 3)	Quotes that show positive attitude towards I4.0 changes.	Positive about I4.0 changes
"I'm very happy with TMS." (Employee 3)		
"Everyone was impressed of it." (Team Lead 4)		
"And of course, there are some things TMS is missing currently because it's not that far developed that other software are at the moment." (Employee 4)	Quotes that show negative attitude towards I4.0 changes.	Negative about I4.0 changes
"But that's also something like every employee needs to work with a platform as well because we also have the issue that not everyone is working as much with the platform as they could." (Employee 6)		
"But anyhow, TMS got wrong data provided. And then this email went out to the customer who was then completely confused and called me saying, why could it be that we're getting now a delay of more than one week. So, and then I said, Oh, please ignore it, our new developed system made a small error, we are working on it." (Team Lead 4)		

"It makes our life easier, so we have more support and less work and pain points on our shoulders in the operations team because work also increased due to Corona and the Suez Canal crisis." (Team Lead 3)	Quotes that show positive attitude towards general changes within LogistiX.	Positive about general changes
"One thing I can say is that at LogistiX all these changes are for good. But it takes time to adapt also." (Team Lead 2)		
"Regarding changing names, creating our LogistiX now entity, we were not ready yet. It's an, it's again, the wrong moment that they did it in my point of view. So, yeah, for me it's not necessary, but they pushed it." (Team Lead 1)	Quotes that show negative attitude towards general changes within LogistiX.	Negative about general changes
"I personally don't like too many changes at one time, so that's, if we have high workload and too many changes in projects, it's kind of also demotivating for the team." (Team Lead 3)		
"And to make sure that we all can work as efficient as possible." (Employee 2)	Quotes from respondents who stress the benefit of being more efficient using the software.	Increase of efficiency for employees
"It saves us a lot of time." (Employee 1)		
"To make us more efficient. And by the end, of course, as we are a company to save money by the end." (Team Lead 5)		
"So it is very convenient because you have all your shipments in the great overview and you have all the tasks which are due to, to that specific date, like for example for today and you see which shipment needs action and then you are just working at your tasks for the day which helps you not losing the overview" (Employee 1)	Quotes from respondents who stress the benefit of being more productive at work using the software.	Increase of productivity for employees
"But in general, I would say that these connections can		

help us to focus on the really important things like customer service." (Employee 4)		
"And if you don't have that kind of support in the system, you would do more mistakes and forget things. It's easier to work in a team because everyone can see what's the status. And you are also connected with our partners and agents and overseas." (Team Lead 3)		
"So that's the fact that I make less mistakes then and to improve my work given to clients." (Employee 8)	Quotes from respondents who stress the benefit of increasing the quality of work using the software.	Increase of quality of work
"Let's say let's say in 90% my job totally benefits from it because it keeps it helps me updating the customers." (Employee 5)		
"So, the point of visibility and also transparency is always a critical part." (Team Lead 2)		
"TMS and FLOW contributed a lot to having a good environment because you are not stressed and angry or in a bad mood." (Employee 3)	Quotes from respondents who stress that using the software increases their work satisfaction.	Employee satisfaction
"So, speaking about TMS, it is really good because it is like built on the needs every operations manager has during his daily tasks." (Employee 1)		
"And they're always adding things to team that is making it easier for us, but also for customers." (Team Lead 1)		
"Yeah, just that it provides the customer with all the visibility needed." (Employee 2)	Quotes from respondents who stress that customers gain more efficiency booking shipments with the software.	Increase of efficiency for customers
"So I think it's better for the customer before they don't have to call the forwarder or send him an email and the information is much faster." (Employee 7)		
"So, what I can say is the biggest innovations or the biggest new features are the		

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EDI transmission so that we are able to place bookings with the carrier without sending an email, but simply via EDI connection within our system." (Employee 4)		
"And are any documents missing or something like this? And before that you always had to request this via mail and at FLOW our customer can just open his account, he has the overview of a shipment list and can just see all the information or his task points or what he needs to do." (Employee 1)	Quotes from respondents who stress that customers are more productive when booking shipments with the software.	Increase of productivity for customers
"And with that information they can adapt their supply chain when they're going to the let's say, for example, when they are going to receive the cargo and what they promise to their customer et cetera." (Employee 5)		
"So, customers know where their products are and next to that we also have that order management system or we had it in the past to not only provide it based on container data, but also on product and order data, so they can act accordingly to changes." (Team Lead 3)		
"And again, transparency is key because we are not lying to the customer. I mean the information that the customer sees is the information that we receive from the order, from the carrier, from the transport company." (Employee 3)	Quotes from respondents who stress that customers experience a higher quality when booking shipments with the software.	Increased quality for customers
"And I have seen quite big increase of the data quality on those topics. It isn't that only related to the data quality of the ETAs, but also other milestones which are of course have impact on the process." (Employee 2)		

"The MoTs is a new step in terms of visibility for our customers. So, we have a platform where customers can book their shipments and can track their shipments and everything can claim invoices and everything, get rates on our platform and so on. And with the MoTs, I think this was a very big step to really make the shipment visible to the customers so they can see in real time where is my shipment and what is the next step, What was the last step at which time which step was made." (Team Lead 5)		
"It was not my direct supervisor in this case because when I started at LogistiX, LogistiX had this thing called a buddy program, which means that if you're starting at LogistiX, you get a buddy, which is one of your future team members, and he's just going through all the systems with you like FLOW and TMS." (Employee 1)	Quotes from respondents that mention the available resources for familiarizing themselves with the software.	Resources for development
"I would say everything that I need from my supervisor is always there so he can provide me with anything I need from him." (Employee 4)		
"And then, of course, the best way is training. So, to make it with them together or also we have, I think everywhere at LogistiX we have this buddy system." (Team Lead 4)		
"Well, mostly our supervisor does not communicate changes because we are communicated changes by let's say our process team." (Employee 5)	Quotes from respondents that mention the available environment for familiarizing themselves with the software.	Environment for development
"And I mean, there are specific channels in Slack where you can also inform people about		

the major issues or major bugs." (Employee 1)		
"I have regular one on one sessions every week with every one of my team and where we can talk about problems, what is going well, what is going not so well." (Team Lead 5)		
"And speaking of TMS, if you consider that this is an in-house build TMS system is really good, and it really makes a lot of fun most of the time working with it." (Employee 1)	Quotes from respondents that mention the available easiness of familiarizing themselves with the software.	Ease to learn I4.0
"In regards to FLOW and it also goes for TMS, but especially FLOW, it's super easy to handle." (Employee 2)		
"So, most of them really like the system because it's easy." (Team Lead 3)		
"And also FLOW the customer side of the tool, it's very well developed because all the information is very well organized in a visual way because not all the customers have the same knowledge or experience with shipping. So, it's very intuitive and it helps a lot the customers because sometimes the customer can feel overwhelmed." (Employee 3)	Quotes from respondents that mention the intuitive nature of the software.	Intuitiveness of using I4.0
"(…) that it's very intuitive the shipping software and very easy to use." (Team Lead 4)		
"S, but easy to understand." (Team Lead 4)		
"I always see my emotions." (Employee 5)	Quotes that show respondent's self-awareness of their emotions.	Understanding of own emotions
"Fully aware." (Employee 1)		
"I would say I'm very aware of my emotions because I have seen a lot actually in my working career." (Team Lead 5)		
"I'm calm and relaxed because I think that a balance is possible between technology and people." (Employee 3)	Quotes from respondents who experience a positive effect of the software on their emotions.	Positive influence of I4.0 on emotions

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"When I hear about new features that are planned to be released, I'm usually happy about it and I'm not worried that something might change or that something might become more complicated or something like that." (Employee 4)		
"So if there are changes and quite often and it's impacting me on my daily work, I'm not a person who is negative per default. So my first message to myself will always be, Oh, great, something changed. Meaning I need to make sure I'm speeding up, learning what has been changed and why, and what is going to do, so asking myself, What is the impact? And also understanding the logic. I think for me, it's not negative." (Team Lead 1)		
"But on the other hand, it's also kind of demotivating seeing that tech for example, is working on a lot of things. But a small change that has been requested, they have no capacity and it just got turned back to the ops manager like, okay, you can do this, just do it." (Employee 1)	Quotes from respondents who experience a negative effect of the software on their emotions.	Negative influence of I4.0 on emotions
"I'm of course sometimes when let's say when TMS is down and I have a lot of work that it can be a bit frustrating." (Employee 5)		
"On the one hand, you still have to consider because we had the cases where something was implemented, which is kind of, we had the feeling that IT did not prioritize this good enough or did not have the capacity to implement it. And that was then like given back to the ops managers, so we had a bigger		

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workaround with a technical change because like different persons, like there was no capacity at IT or something and we're starting from the beginning when there was information that a technical change is coming, everyone is hyped and like, okay, let's see. And if then the information is coming, hey, there's just a certain new workaround and this new feature is not going to be implemented, it's kind of devastating to be honest, because actually a technical change should save us time again and not just creating new workarounds for the ops managers. So that's a big minus and that's also not very good for the motivation." (Employee 1)		
"It's a technical thing, so I don't have any emotion. It is how it is, you know. I'm in this case, I'm very pragmatic." (Employee 7)	Quotes from respondents who experience a neutral effect of the software on their emotions.	Neutral influence of I4.0 on emotions
"And you can get emotional, you can be upset, but it will not help TMS to work again." (Employee 5)		
"So, in general I wouldn't say I'm a cold person, but I won't let problems get too close to me." (Team Lead 5)		
"But again, I can be I can be really upset, but it will not help us solve the situation. So, we'll just escalate it to the right people to solve it and to get the customers happy again." (Employee 5)	Quotes that show respondent's self-reflection of their emotions.	Self-reflection of emotions
"So yeah, but as far as I know and my experience at LogistiX is that all the changes had sense." (Employee 3)		
"I have to be open for change management. That's sometimes you just want to work in the system like it was		

before. And I'm not really open minded sometimes and stressed or not aligned with any new process." (Team Lead 3)		
"When TMS is down and I have a lot of work that it can be a bit frustrating. But I always see that is unfortunately beyond my control. The only thing we can do is leave it to the tech department who is specialized in solving those things and patiently waiting until they do." (Employee 5)	Quotes that show respondent's self-regulation of their emotions.	Regulation of own emotions
"I always see like two different versions of myself. You have the working mode, and you have the private mode. And I'm always very good at separating those two characters. So, I'm always very actually I'm a very calm person, sometimes, of course, when you are committed to something, you can be emotional, but I'm always very down to earth when it comes to that." (Employee 5)		
"But I always remind myself to say, okay, it's I would say just work and some things happen which cannot be changed and which I cannot influence, or some decisions are made which I cannot influence. Like the direction, I don't know the development points in our TMS and so on. Of course, I have to communicate it to my team and often I know, okay, maybe they are not happy with it." (Team Lead 5)		
"But I think they're always happy that they have the possibility to discuss it again." (Team Lead 3)	Quotes that show respondent's ability to recognize other's emotions.	Recognition of other's emotions
"So, anyhow, it's always possible, of course, also the negative feelings or negative emotions if they're not happy		

of any function or thinking, no, that's not the best way how it could work. So, that's something you always see, and also which I always recognize." (Team Lead 4)		
"Ask yourself, okay, what is the impact? Why are we doing it? Why are the changes coming in? And then you see that the mindset also will change by the impact." (Team Lead 1)		
"Sometimes the operator can have the feeling that those changes are not very related or focused on their work. But as with all changes at the beginning, I mean, we have to be patient and give the needed time for the changes to be established, to be improved because sometimes we can think, oh that change has nothing to do with me, you know, and, and yes, at the end it's going to help you in your daily task." (Employee 3)	Quotes that show respondent's effort to empathize.	Effort to empathize
"First, I tried to understand their point. I asked, what is their opinion because, after all, my leadership, my thought of how leadership should be is not like an imposition. So, I try to understand their points and ask about their opinion and also translate this point to the other departments related." (Team Lead 2)		
"And I don't know if I do it always good or correct, but I do my best because the main point for me on this job and this leadership position is my team and their opinion." (Team Lead 2)		
"Yeah, well, she made me feel like very let's say involved because she, as far as I know, the communication is very transparent." (Employee 5)	Quotes from respondents that mention a lateral leadership style of team leaders.	Inspirational leadership

"He takes into account not only my opinions, but all the team's opinions." (Employee 3)		
"And I think this will also motivate the employees to be more positive about TMS when they take part of the development." (Team Lead 5)		
„This kind of tool was new for me. So, she has introduced it to me in a positive way and showed me all functions, etcetera, but also with the information that there is still work on it." (Employee 7)	Quotes from respondents that stress a high degree of communication shown by team leaders.	Leader communication
"My direct supervisor (…) did actually introduce me to TMS in every detail and from A to Z, with all the things that TMS may hit." (Employee 8)		
"You have the confluence page and also for TMS and we have also weekly meetings where we are talking about new rollouts and also about maybe issues." (Team Lead 4)		
"And if the direction is clear, then of course it gives you a better feeling of where we're heading in the right direction." (Employee 2)	Quotes from respondents that mention a charismatic leadership style of team leaders.	Charismatic leadership
"As I said, they are not always happy with my response because I am also not in the position where I can change things or can change the system from one day to another. But in general, they understand my points, I would say. So, most of the time I'm able to switch them around to be a little bit more positive again." (Team Lead 5)		
"I think sometimes they're a little bit annoyed because I'm always really positive. But to be honest I think if I'm disagreeing with the changes, then they will know it's for real, right? So and I think that's the feedback		

that I'm also receiving." (Team Lead 1)		
"And mostly with my supervisor, we talk about performance related topics and not about development like new technologies." (Employee 5)	Quotes from respondents that mention an encouraging leadership style of team leaders.	Encouraging leadership
"And then I ask them the question, Hey, did you already try this? And if they're saying, so quite often they are saying, yes, I did and then okay. But if I'm looking at the logic of TMS, so at the end giving them also the feeling that they are accountable for their own actions, but also making sure they search for the root cause. So if there's something not going well or wrong or it can be everything and giving them the option to deep dive by themselves by allowing them, and I think maybe that's nicer, right? So by asking, I will assist them in making sure they have the time to deep dive. But it's important that they have the option to do so." (Team Lead 1)		
"Making them accountable. And I fully live up to that because if they are asking help for certain task in TMS, I always before I'm saying something, I'm going to deep dive and search, right?" (Team Lead 1)		
"I mean, they are asking on a constant basis if there are any pain points, we are feeling with TMS." (Employee 1)	Quotes from respondents that mention support from team leaders.	Leader support
"There's one customer who is really asking a lot of questions and always expecting us to have a great overview of what we are currently working on for him. At the beginning I thought it was really difficult to match his needs and then my		

supervisor showed me a way how we can create reports in FLOW." (Employee 4)		
"One of my team members sometimes forgets to upload some documents, some customs document, and I saw them, one example of what is the consequence, and there was a customer that couldn't see the documentation, so I told them, please always you receive this documentation, upload it, because otherwise the customer is going to ask you the documents by email. And this way you're avoiding more emails in your inbox. So, if this customer proactively received download this documentation, please do it because you are after all reducing your manual work. You are doing it in advance." (Team Lead 2)		
"We have the possibility to influence things." (Employee 2)	Quotes from respondents that mention an inclusive culture within the company.	Inclusive culture
"Everyone is very open minded, which helps us to understand different points of views and different points of views in different departments, which is very important." (Employee 6)		
"I think or in my point of view, I was allowed to come with ideas and everybody was listening or having the patience to listen to you." (Team Lead 1)		
"As an open culture. I'm aware the leadership is open for feedback where you can also give it." (Employee 2)	Quotes from respondents that mention a growth culture within the company.	Growth culture
"Very driven by the vision we have." (Employee 1)		
"Open minded, respectful, and just always going forward, I would say." (Team Lead 3)		
"The culture of LogistiX. Well, I think it's pretty progressive." (Employee 8)	Quotes from respondents that mention a mutual support culture within the company.	Mutual support culture

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"So best example, for example, the value "we are one". So, in case someone is sick or not there and the team steps together in order to get the tasks of the colleague done. We also had some busier times last year in summer where we had way to less people. And no one was there saying, okay, no, I'm not stepping out. I have no time to support you. So, we sit here as a team together until evening to get everything **done.**" (Team Lead 4)		
"So, the culture, the most important value, in my opinion for the culture is we are one. So, we are a team. So, everyone is jumping in for the other one, helping each other out whenever they can and so on, and no one gets left alone." (Team Lead 5)		

Note. The bold quotes stem from team leaders, the other ones from employees.