Toward 'Industry 4.0' and team effectiveness: Best practices of employees of a transitioning organisation

Master thesis

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A case study

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Management Summary

Background – Organisations have continuously been faced with industrial revolutions. Currently, a fourth industrial revolution is observed which is focused on digitalisation of processes, full automation, electronics and information technologies. One area that is mostly overlooked in this research is the transferring of the industry. This research is focused on how teams in a transferring case-organisation to the 'Industry 4.0' environment are able to establish team effectiveness. This is done by providing a comprehensive review of literature on 'Industry 4.0' and team effectiveness. The literature on 'Industry 4.0' shows that there is not yet a lot of knowledge about team collaboration. The IPO and IMOI therefore provide the frameworks for the input and the explanation of how team effectiveness variables are important for establishing team effectiveness.

Methodology – This research is based on a case-study of a multinational in the South of Germany. The case-organisation has made the first changes to adapt to the new 'Industry 4.0' environment. Two rounds of semi-structured interviews were conducted. The first round of interviews 18 participants participated and the second round of interviews 7 participants cooperated. The first interview guide focused on getting as much knowledge on how team effectiveness in successful and unsuccessful teams is established. Therefore, most areas of the IMOI model were covered. The second round of interviews focused on acquiring more information regarding unclarities or interesting points gathered in the first round of interviews.

Results – The results show an extensive summary of the experiences of the different participants that participated in the 'Industry 4.0' teams. Extensive lists are given about favourable team members and team leaders. Furthermore, the results show negative and positive points, suggestions and descriptions of ideal situations. The result section also shows that all the different variables are connected to each other.

Discussion – In the discussion four important points are discussed. The participants observed four points namely that the case-organisation is still very hierarchical, goals, expectations and focus of different stakeholder often do not align, resources are often perceived to be limited and there is no consensus on how the 'Industry 4.0' environment is implemented within the organisation. Practical implications that are offered are multiple session between higher management teams and new project teams in the 'Industry 4.0' environment focused on aligning expectations and goals. Furthermore, a digital platform with available employees for team collaborations could be created to decrease organisation effort to create teams and provide departments with a financial budget to design collaboration rooms for the new teams.

Conclusion – This research is one of the first researches to ask employees how 'Industry 4.0' has impacted team effectiveness. The research is able to find pain points within the team collaborations and give suggestions on how to improve these pain points.

Abstract

One of the latest changes in the industry is the fourth industrial revolution. There is still a lot of unclearness surrounding this new change. One research area that has not yet been thoroughly research is the transferring of the industry to an 'Industry 4.0' environment. This research is focused on finding out how organisations that are transferring to an 'Industry 4.0' environment establish team effectiveness. Currently, there is not yet much information about collaborations in the 'Industry 4.0' environment. Therefore, the widely accepted IMOI model is used to explain what teams often need for team effectiveness. This IMOI model is the input for the first semi-structure interview round. The second round of semi-structured interviews is conducted to acquire more information on unclarities and interesting points. Four important findings have been found by this research. The case-organisation is perceived to have an hierarchy, goals, expectations and focus of different stakeholders do not align and team members often feel that there is a lack in resources. The outcome of this research is a clear overview of pain points in team collaborations and extensive knowledge on good team leaders and team members.

Keywords 'Industry 4.0'; team effectiveness; IMOI; autonomous teams; case study;

Preface

A few days ago, we had a family-outing to Elizabeth in concert. One line said during this evening kept circling in my mind.

"So wie man denkt, so kommt es nie"

"Lucheni" Elizabeth, the musical.

This wisdom is very applicable to this last year which has been characterised by the progress of this master thesis. First of all, a change within an organisation does not always have the result you expected. Second, a master thesis is a process that is not always going the way you expect it go. And thirdly, everyday turns out to be a new surprise.

This master research could not have taken place and resulted in this paper without the support of a lot of people. First of all, I would like to thank Matheus Habets for giving me the opportunity to conduct this master thesis and the participants of the interviews for participating in this research. Since, I had the opportunity to live for half a year in Germany, I want to thank all the interns, room mates and my handball team for making it a very rememberable period. I want to thank Kasia Zalewska-Kurek and Matthias de Visser for their feedback on this paper. Furthermore, I appreciate how many people who showed their interest in the progress of this paper. Marion, my parents and my sister thank you for supporting me in making the last adjustments by providing me with suggests for improvements.

Last, but certainly one very important thing to add is that I want to acknowledge my grandmother support throughout the whole of my studies. Wherever you are, I hope you are proud of this paper and celebrating with us that it represents the end of many years of studying.

Table of Content

1. Introduction

Every organisation, both in the private and public sector, is confronted with continuous new challenges they need to respond to (Oreg & Berson, 2011), in order to become more technical, economical and ethical responsive and effective as an organisation (Daft, Murphy, & Willmott, 2014). Especially, the industry sector, which is a part of the economy producing material goods that is characterised by high levels of mechanisation and automatization (Lasi, Fettke, Feld, & Hoffman, 2014), has dealt with multiple changes over the past century. These changes have been known as industrial revolutions. The first industrial revolution, around 1780, was characterised by mechanisation (based on the development of the steam engine). The second industrial revolution occurred around 1870 and was characterised by the intensive use of electrical energy. Continuing, the third industrial revolution is based on computers and connected with 'flexible automation' and was introduced around 1970 (Lasi et al., 2014; Kang et al., 2016; Basl, 2017; Götze & Jankowska, 2017; Lin, Shyu, & Ding, 2017; Santos et al., 2017). Roblek, Meško, and Krapež (2016) found that a fourth industrial revolution is occurring now. Furthermore, these researchers found the new environment to be characterised by the use of full automation, digitalisation processes, electronics and information technologies. It requires each organisation and individual to rethink expectations and desires from smart projects and internet-connected machines (Roblek et al., 2016).

1.1. Theoretical and Practical Relevance

Multiple scholars and practitioners have worked for years trying to get an improved understanding of how they need to arrange their organisations to be as efficient and productive as possible within changing environments. The fourth industrial revolution is referred to differently in different countries. In Germany, it is referred to as 'Industry 4.0' (Kang et al., 2016; Sanders, Elangeswaran, & Wulfsberg, 2016; Lin et al., 2017); in the United States of America this revolution is called 'Advanced Manufacturing Partnership'; United Kingdom has introduced 'Future of Manufacturing' (Liao, Deschamps, De Freitas Rocha Loures, & Ramos, 2017); China uses the term 'China Manufacturing 2025' and Taiwan developed 'Productivity 4.0' (Lin et al., 2017). The focus of this research is the 'Industry 4.0' environment that can be found within Germany, which spread through Europe and numerous countries outside of Europe since its introduction (Liao et al., 2017).

Now a days, the term 'Industry 4.0' is often used in contradictory contexts and has not yet received an explicit definition (Brettel, Friederichsen, Keller, & Rosenberg, 2014; Lu, 2017). Additionally, Rodič (2017) describes 'Industry 4.0' as a hyped phenomenon that has not yet produced a product that can be bought. Though, various authors have been able to reach consensus on the fact that 'Industry 4.0' is based on Cyber-Physical Systems ("CPS vertically integrates the physical world of production plants and embedded devices, based on the Internet of Things, with the virtual world of business process, the Internet of Services and social network systems for human-machine communication, the Internet of People"; Prause & Weigand, 2016, p. 106), the Internet of Things (IoT), the Internet of Services (IoS; Almada-Lobo, 2016; Kang et al., 2016; Sanders et al., 2016; Thoben, Wiesner, & Wuest, 2017) and the Smart Factory (Roblek et al., 2017; Thoben et al., 2017).

Consequently, Götze and Jankowska (2017) mention that 'Industry 4.0' is radically going to change the known business models of organisations and transform these organisations into modern industries. As observed in the past, the first observed changes are technical. Alongside, the different current and past technological innovations, organisational structures have also shown a pattern of change (Brettel et al., 2014). Brettel et al. (2014) have found that the first organisational structures were characterised by a strict division between labour and standardisation. Hereafter, organisational structures started focusing on product outcomes and productivity without regards to variation in customer needs. The third revolution showed a focus on product differentiation, because of a developing buyer's market. Currently, Brettel et al. (2014) expect that organisations will change their organisational structure to cope with an increased complexity. Götze and Jankowska (2017) state that the new organisational structures will be associated with diversity and urbanisation instead of specialisation and agglomeration which have dominated previous organisational structures.

What can be concluded from this past research is that different researchers expect a change in the organisational structures of established organisations or have made small comments of expected structures. Though, past research into the phenomenon 'Industry 4.0' has mostly overlook research topics as collaboration mechanism strategies (Schuh, Potente, Wesch-Potente, Weber, & Prote, 2014), the context of 'Industry 4.0' and the transferring of the industry (Pfeifer, 2017). Thus, only expectation have been found in research, but these expectations have not been thoroughly tested. Salas, Stagle, and Burke (2004) found that one of the most profound and ongoing changes of organisations have been transforming their organisational structure from flat, traditional and hierarchical structures to teams and multi-team systems. However, according to the research of Schlechtendahl, Keindert, Kretschmer, Lechler, & Verl (2015) most organisational structures within 'Industry 4.0' organisations are still characterised by hierarchical structures and therefore have not yet been able to implement a lot of changes in their organisational structures. Though, because of the fact that organisation expect their employees to be able to operate in teams (Day, Gronn, & Salas, 2004) and that teams often propose and pursue new implementations (Hülsheger, Anderson, & Salgado, 2009), it is important to get an understanding of how teams can operate effectively in the new organisational environment. This research, therefore, is one of the first researches focused on acquiring attitudes of employees working in an 'Industry 4.0' organisation in Germany on how effectively their teams have operated.

1.2. Research Aim and Article Structure

Since teams have been perceived in past research to be important entities within organisations and 'Industry 4.0' is seen as the new phenomenon that influences the organisational environment, it is necessary to get an understanding of how these teams can operate effectively in these new organisations. The aim of this research is to find how team effectiveness of a German organisation transferring to the new 'Industry 4.0' environment is impacted by this change. Accordingly, the research question is:

"How does an organisation that is transferring to an 'Industry 4.0' environment establish team effectiveness?".

This research question should provide the literature with an improved understanding of collaboration mechanism strategies, how the transferring of the organisation is observed by employees working in the environment and explain how 'Industry 4.0' is perceived by employees working with this new phenomenon. To gain this knowledge, this research knows the following structure. The theoretical framework will contain an extensive literature review of 'Industry 4.0' and the application of the IMOI model to the new phenomenon. The theoretical framework will be followed by the methodology chapter describing the two rounds of semi-structured interviews. The first semi-structured interview is based on the knowledge gained from the theoretical framework and the second semi-structured interview is based on unclear and interesting findings in the first round of semi-structured interviews. The methodology chapter will be followed by the result section which highlights the experiences, knowledge, observations and feelings of the participants. The paper will be conclude with the discussion and conclusion chapter.

2. Theoretical Framework

To be able to understand how organisations participating in the 'Industry 4.0' environment are able to create team effectiveness, it is important to provide a comprehensive understanding of what the constructs team effectiveness and 'Industry 4.0' entail. Therefore, this theoretical framework is focused on giving a comprehensive understanding of both these constructs. The first contemporary ideas about teams started to develop into the 1930s and 1940s (Leavitt, 1974). During the 1960s and 1970s interest into groups declined in social psychological research (McGrath, 1997). The rise of global competitiveness from collective societies, increased complexity, volatility of the organisational surroundings, the ending of bureaucratical structured organisations and the simplification of jobs spurred renewed interest into team collaborations (Mathieu, Hollenbeck, Van Knippenberg, & Ilgen, 2017). Further developments, as the digital age which started in the 1990s, demanded organisations to find new ways to structure, manage and deploy human capital to remain operational (Mathieu et al., 2017). The research of Sundstrom, De Meuse, and Futrell (1990) that was conducted at the start of the digital age pointed out that modern and effective organisations need to implement small teams for multiple varieties of jobs. In the meantime, Marchiwinski and Mandziuk (2000) found in their research that one individual employee will always lack the abilities and the knowledge regarding a topic that a team can acquire. This finding kept the subject teams an interesting phenomenon to engage in for organisations and research. At the same time observations were made that represented the start of unstable organisational environments, because of the constant introduction of changes. Over the past years, organisations kept on being confronted with global competition and consolidation as well as innovation, which has created a constant pressure on organisations to have diverse skills, expertise, experiences and teams that enable rapid, flexible and adaptive responses within their environment (Kozlowski, & Bell, 2003).

Now-a-days, organisations are forced to deal with an increasing pace of societal and technological developments as decreasing accessibility of natural resources, increasing energy prices, older age and an expansion of global markets (Ganzarain & Errasti, 2016). To be able to react to these developments, the German government introduced 'Industry 4.0' in 2011 at the Hannover Messe (Kang et al., 2016; Pfeiffer, 2017; Santos et al., 2017). A technology-enabled transformation as 'Industry 4.0' will only realise its full potential when different dimensions are redesigned and adapted according to the new strategy and visions (Agarwal & Brem, 2015). Business process redesign is the most important stage within the transformation (Agarwal & Brem, 2015). Though, this research represents one of the first researchers which is focused on how in a case-organisation, that is transferring to an 'Industry 4.0' environment, team effectiveness was experienced by employees operating in teams. This is vital information, since research of Salas et al. (2004) observed that organisation still have difficulties to compose, develop and manage teams. Therefore, this theoretical framework will first clarify the phenomenon 'Industry 4.0'. Thereafter, the theoretical framework will focus on known knowledge about team effectiveness. The theoretical framework will be concluded with a summary of all the given knowledge in this chapter.

2.1. The Phenomenon 'Industry 4.0'

'Industry 4.0' has become a recurring theme and frequently discussed topic of many conferences, forms and exhibitions for quite a few years (Liao et al., 2017). 'Industry 4.0' is a phenomenon that embraces "networked manufacturing", "self-organising logistics" and "customer-integrated engineering" (Prause, 2015, p. 164). Even though, there is a clear understanding that a wide batch of interdisciplinary technologies is going to facilitate the new environment, there is not a clear or specific definition of 'Industry 4.0' (Brettel et al., 2014; Götze & Jankowska, 2017; Lu, 2017). Basl (2017) and Prause and Weigand (2016) have both used definitions of 'Industry 4.0' that are applicable to this research. Basl (2017) defines 'Industry 4.0' as "a way to improve production processes, to increase productivity for batch size equal to 1 to reflect individual demands and short term wishes. It helps to reduce lead time and time to market. It helps transparency in real time, to make faster and more flexible decision making, to archive global optimization in development and production" (p. 4). Prause and Weigand (2016) have another definition that states "Industry 4.0 facilitates a shift from a centralized toward a decentralized production system based on rather than a machine. The communication among Industry 4.0 components, machines and humans, relies on context-aware systems rather than a centralized control of production. Context-awareness thus facilitates a self-controlled autonomous systems" (p. 108).

Moving into this new context means that organisations need to be able to adopt the proper Big Data technologies which will give them the ability to collect, store, process and analyse data (Santos et al., 2017). This should result in collaborative productivity, because of the following four enablers which influence and depend on each other (Schuh et al., 2014):

- IT globalisation – enveloping computer advantages, storage capacity and high-speed computing and clouds which will make it easier to recall information from any location;
- single source of truth – using simulation as a decision tool;
- automation – entailing integration of IT into the industrial environment which means that this environment will be characterised by decentralised and autonomous processes;
- cooperation – embodies the collaboration across all borders, technologies and activities and the empowerment of decision-makers in the decentralised environment (Schuh et al., 2014; Götze & Jankowska, 2017).

'Industry 4.0' is, further, characterised by the following main features (Wang, Wan, Li, & Zhang, 2016; Liao et al., 2017):

- horizontal integration, which can be described as the integration of organisations that compete and cooperate together in value networks;
- flexible and reconfigurable manufacturing, which is provided to organisations by the vertical integration of hierarchical subsystems;
- product customisation, which will be enabled, because of end-to-end engineering integration.

Though the above points show that automation is important, Pfeiffer (2017) has noted that 'Industry 4.0' is completely human-centred.

The above specified knowledge of what 'Industry 4.0' is, can be perceived as a manifestation for an organisational future characterised by fragmentation, new structures and business models that will change the organisational environment in the coming future (Prause, 2015). This means that future production systems are being changed to increase product individualisation and to become more flexible (Schlechtendahl et al., 2014). Thus, 'Industry 4.0' will change entire organisational plants by making them smart and able to use mass customisation (Sanders et al., 2016). To do this, 'Industry 4.0' will use technological innovations to boost productive processes with the integration of more automation, and the implementation of controlling and information technologies (Santos et al., 2017). It will change the design, manufacturing, operations and services of products and production systems (Ganzarain, & Errasti, 2016). Currently, the knowledge on how the organisational structure is changing is limited. Prause (2015) is one of the only researchers to explicitly name a possible organisational structure for organisations participating in the new environment. He indicates that fractal organisation will be suitable structure. These types of organisations are based on the close and intensive internal relation between materials, persons and information within a fractal in comparison to outside fractal relations (Prause, 2015). This would mean that an organisation will exist of different fractals connected by information flows which force internal processes and external processes between networks of fractals (Prause, 2015).

Other researchers have found self-organisation, self-similarity self-optimisation, goal-orientation and dynamics to be attributes of the 'Industry 4.0' environment that will develop flexible and adaptable organisations (Prause, 2015). Lasi et al. (2014) and Prause and Weigand (2016) indicate that there will be a shift from centralised to decentralised production systems. Experts interviewed by Brettel et al. (2014) agreed with this observation and indicated that decentralised systems will provide organisations with the opportunity to deal with highly complex environments and the need for customised products. Though, these systems need to be researched more thoroughly (Brettel et al., 2014). A long the same lines, Zawadzki and Zywicki (2016) assume that these new work environments will be autonomous units that are able to plan, organise and control production by themselves. According to Prause and Weigand (2016) the development of the self-controlled autonomous systems will be facilitated by a perceived context-awareness.

Liao et al. (2017) support these statements in their eight priority areas of action. Their point on work organisation and design indicates that organisations should implement the socio-technical approach within their organisation to authorise an opportunity for greater responsibility and increase personal development. Though, the last 20 years research in non-hierarchical networks that use autonomous structures, in the most cases, only have occurred in R&D project or living labs (Mladineo, Veza, & Gjeldum, 2017). The literature on 'Industry 4.0', thus, shows that organisations should focus on how they are going to design their work units. Since this same literature is only able to name assumptions or possibilities, this research will focus on best practices of employees within an organisation that has shown to adapt to the 'Industry 4.0' environment. Employees that have experience with team collaboration are asked about their experiences to be able acquire an improved understanding of how team effectiveness can be achieved in the new environment and add the first real-life experiences to the existing literature. To be able to find this information, the remainder of the chapter will focus on the IMOI model.

2.2. Team Effectiveness in 'Industry 4.0'

Hackman (1987) was one of the first researchers to conclude that there has not been a well-tested and accepted bundle of research and theory that can support practitioners in their use of teams within organisations. This conclusion has resulted in more research into teams and the development of multiple models. Developed team effectiveness models have all contained the underlying assumption that teams are "complex, dynamic systems, existing in larger systemic contexts of people, tasks, technologies and settings" (Ilgen, Hollenbeck, Johnson, & Jundt, 2005, p. 519). There are two types of models that are often used when team effectiveness is researched, namely the IPO model and the IMOI model. The IPO model is a product of the third early school of thought in team research and is associated with McGrath, Allport, Altman, Davis, Hackman, Shas and Steiner (Mathieu et al., 2017). This early school of thought is referred to by McGrath (1997) as the Illinois School. The IPO model cannot be referred to as a theory, but it is a very simple framework that can be used to measure team effectiveness (Day et al., 2004). Hackman (1987) was one of the first researchers to develop a widely accepted normative IPO model (Ilgen et al., 2005; Morgenson, Johnson, Campion, Medske, & Mumford, 2006; Hülsheger et al., 2009; Bjornali, Knockaert, Foss, Leunbach, & Erikson, 2017). The key assumption of the IPO model is that the inputs in a team will affect the outcomes, because of the interaction that take place between the different team members (Hackman, 1987). The IPO models "serves a basis for classifying team-level variables that have been studied in primary studies into input and process factors" (Hülsheger et al., 2009, p. 1129).

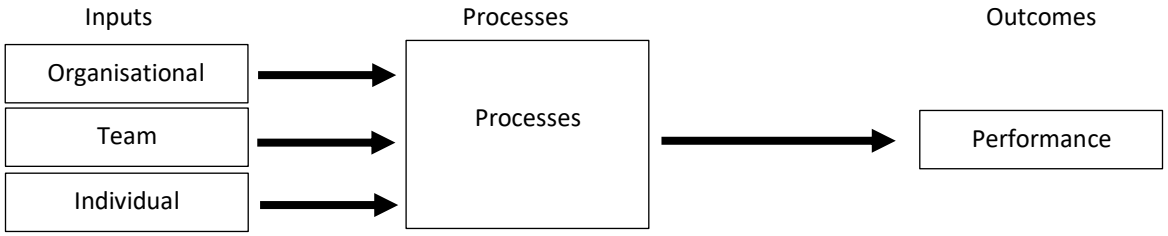

Figure 1. Schematic overview of the IPO model. Adopted from "Team effectiveness 1997-2007: A review of recent advancements and a glimpse into the future." By Mathieu, Maynard, Rapp, & Gilson, 2008, *Journal of Management, 34*(4), p. 413.

Though, being an accepted model, the IPO model has a few limitations. The most important limitation is the suggestion that there is a final end state, implying the model follows a single and linear path, because there is a notion of an outcome (Day et al., 2004). Even though, McGrath (1997) has indicated that the IPO model has always been used in its narrow band of possibilities, it did not withhold Ilgen et al. (2005) to develop the IMOI model. This model addresses the limitations of the IPO model and distinguishes between multiple types of processes and outcomes (Mathieu et al., 2008). Ilgen et al. (2005) used the IMOI model to be able to point out the importance of feedback loops and time in teams. Team effectiveness can namely be an outcome at one time period, but it can also be considered as an input and part of the process influencing the performance in a subsequent time frame (Ilgen et al., 2005). The "I" of the IMOI model still refer to the inputs, processes are replaced by mediators ("M"), because they are considered to have more explanatory power on the outcomes ("O"). The additional "I" stands for cyclical causal feedback which is critical to understand how teams perform over time (Ilgen et al., 2005).

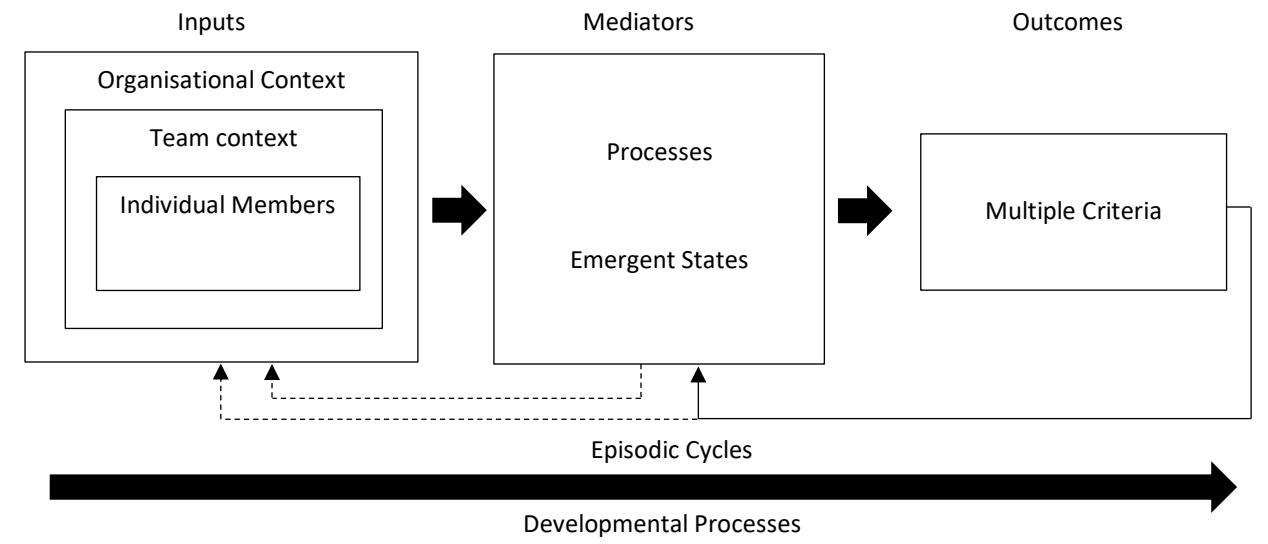

Figure 2. Schematic overview of the IMOI model. Adopted from "Team effectiveness 1997-2007: A review of recent advancements and a glimpse into the future". By Mathieu et al., 2008, *Journal of Management, 34*(3), p. 413.

Since the research of Hackman (1987) a lot of knowledge has been gained within the research area that is focusing on team effectiveness. Though, teamwork will always be a dynamic and elusive phenomenon (Day et al., 2004). It is a bundle of interrelated and flexible cognitions, behaviours and attitudes that team members should possess to execute effective team functions and achieve greater performance which results in accomplishing shared goals (Day et al., 2004). Though research into teamwork keeps being characterised by being fragmented and lacking a clear clarity of the core constructs (Day et al., 2004). It is, however, important to work with the gained knowledge, because of the shift from simple digitisation (third industrial revolution) to innovations that are enforced by combinations of technologies (fourth industrial revolution) which demand organisations to rethink their way or organising (Rodiç, 2017).

2.2.1. Inputs

According to Mathieu et al. (2008) the inputs are the factors that alter and confine team members' interactions. Inputs can also be described as human capital as for instance individual knowledge, skills and abilities (Day et al., 2004). Narendra, Norta, Mahunnah, Ma and Maggi (2016) found 'Industry 4.0' will remove conventional hierarchical automation structures and will replace this with self-organising networks. These self-organising networks will be able to create faster and more economical profitable response times to market changes (Narendra et al., 2016). Since, this change is described by multiple authors, knowledge has been gained on how input variables theoretically should be designed to result in team effectiveness. Mathieu et al. (2008) have shown that inputs to team effectiveness are the organisational context, the team context and team member characteristics. These different input variables will be discussed below.

Organisational Context

Mathieu et al. (2008) defined the organisational context as an origin of different influences that are external to the team, but belong to the larger organisation in which the team is embedded. The organisational context is important, because the teams are deeply rooted in this context (Kozlowski, & Bell, 2003). Agarwal and Brem (2015) indicate that most industrial organisations are still operating according to business processes of roles and responsibilities and others as defined by the industrial revolution. Mathieu et al. (2008) define organisational contextual variables as "sources of influence that are external to the team, yet emanate from the larger organizational system within which they are nested" (p. 454). It is a macro-context that has subsidiary and corporation characteristics that do not vary a lot among different teams in organisations (Zellmer-Bruhn, & Gibson, 2006). Kozlowski and Bell (2003) have found that the organisational context is defined by technology, structure, leadership, organisational culture and organisational climate.

Organisational Structure

Before the implementation of 'Industry 4.0', organisations were already focused on finding new structures to overcome the negative effects of traditional production schemes (Wang et al., 2016). The change in the organisational environment has resulted in organisations having to cope with increased complexity (Brettel et al., 2014). In the new 'Industry 4.0' it is expected that all participants in the environment are interconnected and sharing information with each other (Schlechtendahl et al., 2014). Wang et al. (2016) expect that the vertical integration of the hierarchical subsystems will result in the smart factory that is characterised by being highly flexible and reconfigurable. Furthermore, the organisational structure should be able to be characterised by being decentralised (Götze, & Jankowska, 2017). Hirsch-Kreinsen (2016) expect that in the future, it will be difficult to speak of distinct models of work organisations and organisational hierarchies. Work processes will become more informal and unstructured (Hirsch-Kreinsen, 2016). The new structures have to be able to deal with increased complexity (Brettel et al., 2014).

Organisational Culture

Organisational culture is very important for the functioning of the organisation and smaller entities within the organisation. The future manufacturing environments have to be productive, flexible, sustainable, secure and safe (Theorin et al., 2016). Furthermore, it should be focused on being able to meet small-lot and customised user demands (Wang et al., 2016). Collaboration is important within the new 'Industry 4.0' environment (Schuh et al., 2014). Therefore, an important value in 'Industry 4.0' is accessibility (Lu, 2017). There should be equal opportunities for the participants without discrimination (Lu, 2017). This means that organisations adopt multilingualism to be able to effectively distribute information and knowledge, implement security to keep the information and processes safe and reliable, make risk assessments to know when to use different activities and security measure and implement universal standards (Lu, 2017). Furthermore, autonomy is also regarded to be very important within the organisation (Schuh et al., 2014). Monostori (2014) found furthermore that the following expectations are versatile and enormous. He expect next to collaboration and autonomy that robustness, self-organisation, self-maintenance, self-repair, transparency, predictability, efficiency and

interoperability will become important. It is expected that organisations operating in this new environment have to deal with complexity. Therefore, autonomous teams can be a solution (Brettel et al., 2014). Though, Agarwal and Brem (2015) suggest that the role of corporate culture is vague in these transforming organisational transactions.

Leadership

Both Ilgen et al. (2005) and Mathieu et al. (2008) have found leadership to be a critical predictor for team effectiveness. The traditional perspective on leadership views leadership to be an input for team processes and team performance (Day et al., 2004). Though, thoughts on leadership have developed since the traditional view has been established. The IMOI model, for instance, is also able to clarify how team leadership is able to originate from individual skills and behaviours and through engaging in shared work advance in team-level leadership outcome, which will be used as an input in the following state of team development and team performance (Day et al., 2004). This means that leadership can be perceived as an input or as an emergent state.

Leadership is most often described in terms of the individual's leader skills, abilities, behaviours and other attributes that will affect team processes and performance (Day et al., 2004). Thus, team leaders will make or break a team, because of the influence they have on the development of the team (Day et al., 2004). Leaders are individual team members that are given responsibility and authority over the performance of the team (Mathieu et al., 2008). These leaders influence the three core process phases (Marks, Mathieu, & Zaccaro, 2001) which will be discussed further on in this theoretical framework. Additionally, they are responsible for creating, fostering, promoting and maintaining a shared understanding which will establish effective teamwork (Day et al., 2004). Day et al. (2004) explained that for them an effective team leader is a person that is able to encourage the mutual performance monitoring and back-up behaviour processes and adaptability as emergent state. Day et al. (2004) indicate that now a days there is an increased expectation that employees are able to operate in teams that have no formally appointed leader. Research and knowledge on leadership have been developed a lot of different forms of leadership that can be established in teams. Especially, when employees are able to identify with the team rather than only with an individual, a lot of different forms of leadership and possibilities to participate in leadership will start to exist (Day et al., 2004).

Srivastava, Bartol, & Locke (2006) expect that this leader will also influence the emergent states and the performance of a team. Though, who is the leader and what it takes to be a leader are questions which keep being ambiguous, dynamic and contextual in all different social contexts (DeRue, & Ashford, 2010). Schuh et al. (2014) indicated that productivity growth can be gained in 'Industry 4.0', because of an improvement in decision making processes. Schuh et al. (2014) and Götze and Jankowska (2017) found that empowerment of decision-makers is necessary in 'Industry 4.0'.

Organisational Resources

Resources can be described as assets, capabilities, knowledge and individuals that are accessible to an organisation (Schuelke-Leech, 2013). They have no value until an individual perceives them to be useful and is going to use them (Gregori, 1987). In general, resources are assumed to be mobile and imitable, but the combination of resources and the use of resources in an organisation is not mobile or imitable and thus provides the organisation with their competitive advantage (Barney, 1991). When dealing with 'Industry 4.0' it becomes essential to focus on resource efficiency (Lasi et al., 2014). "Increasing short-age and the related increasing of prices for resources as well as social change in the context of ecological aspects require a more intensive focus on sustainability in industrial contexts" (Lasi et al., 2014, p. 239). Thus, the goal is to increase economic and ecological efficiency (Lasi et al., 2014). Thus, there will be on -demand-only production and fewer resources will be wasted (Pfeiffer, 2017). Often within 'Industry 4.0' organisations there is a lack of basic knowledge about IT systems and production-process technology (Pfeiffer, 2017).

Technology

McFarland and Ployhart (2015) found the importance of technology and connectivity in the social revolution that is currently taken place. Within the new 'Industry 4.0' organisational environment, technology has become even more important since the new environments incorporates emerging technical advancements to increase industry effectiveness (Wang et al., 2016). Lu (2017) indicated that 'Industry 4.0' is associated with algorithms, big data and high technologies. Götze and Jankowska (2017) expect future organisations to be characterised by intelligent interconnected technological systems. Plotnick, Hiltz and Privman (2016) showed in their research that reliable and well-supported technology can diminish the differences between subgroups that rely on the technology. Sanders et al. (2016) indicated in their research that participants in the 'Industry 4.0' environment need to have smart handheld devices that are integrated with the organisational network.

Team Composition

Kozlowksi and Bell (2003) define work teams as "collective who exist to perform organizationally relevant tasks, share one or more common goals, interact socially, exhibit task interdependencies, maintain and manage boundaries, and are embedded in an organizational context that sets boundaries, constrains the team, and influences exchanges with other units in the broader entity" (p. 334). The team context is developed by top-down and bottom-up processes (Kozlowski, & Bell, 2003). They are influenced by the organisational context and the individual characteristics of team members. Teams ordain a context for team members (Kozlowski, & Bell, 2003). In the forming stage of the team a number of relative independent individuals are put together who all have their own needs, goals and expectations about the outcomes that motivate their behaviour (Day et al., 2004). Team composition can be defined as "a consequence of various social or psychological processes, as a context that moderates or shapes other behavioral or social phenomena, or as a cause that influences structure, dynamics, or performance" (Kozlowski, & Bell, 2003, p. 11). According to the research of Mathieu et al. (2008) the focus on team composition has been on how attributes of individual team members and the combination of these attributes on processes, emergent states and outcomes. West and Anderson (1996) found team member

diversity, team size and team tenure to have an influence on team composition. In more recent research, interdependence was, also, found to have an important influence on team composition (Hülsheger et al., 2009; Mathieu et al., 2017).

Team Member Diversity

Teams can be characterised by being homogenous or heterogenous. According to the homophily principle, team members have the same demographic characteristics are often sharing the same history, experiences and attitudes (Roberson, & Williamson, 2012). On the other hand, when the backgrounds of the individual team members diver a situation may arise in which communication becomes problematic, resolving opposing ideas becomes difficult and reaching consensus is challenging (Hülsheger et al., 2009). Richter, van Knippenberg, Hirst, and Baer (2012) indicate that organisations typically compose diverse teams based on the assumption that diversity promotes cross-fertilisation of ideas and stimulates individual creativity, because it serves as an information reservoir. Additionally, diversity is often treated as a key driver of organisational innovation, since it represents a reflection of an array of knowledge, skills and abilities (Qian, Cao, & Takeuchi, 2010). Though, these different perspectives may also cause more emotional tensions when the team has to make decisions which can result in an increase in affective conflict (Qian et al., 2010). The delineation of blue-collar and white-collar employees is going to be less relevant (Prause & Weigand, 2016). Furthermore, al subsystems will be networked and consolidated (Rodiç, 2017). According to Götze and Jankowska (2017) 'Industry 4.0' is built on diversity and promotes urbanisation. Therefore, it can be expected that this new environment will function most optimal when there is collaboration across boundaries, technologies and activities since interfirm relationships are necessary (Götze & Jankowka, 2017).

Team Size & Team Tenure

Team size and team tenure are the first two variables considered that have not yet been discussed in the 'Industry 4.0' literature. Therefore, they will be together with the sub-heading interdependence be discussed in global terms to have an understanding of what the variable encompass. Task required to be undertaken by a team often indicate the number and type of employees who are necessary (Kozlowski, & Bell, 2003). Only when there are enough members in a team might a situation exist in which a team has enough resources, expertise, skills and knowledge to complete complex tasks (Hülsheger et al., 2009). Recommendations given by scientific literature on team size is difficult to evaluate, because these recommendation are often based on personal experience and not on empirical evidence (Kozlowski, & Bell, 2003).

Team tenure can be defined as the teams organisational experience (Agarwal, Campbell, Franco, & Ganco, 2016). Teams who have a longer tenure are able to recreate structural and strategic routines (Beckman, 2006). Team tenure creates the opportunity in teams for interpersonal interaction among team members (Koopman, Zhou, Lanai, Wang, & Shi, 2016). This team tenure can, also, be described as the amount of time a team is running (Stahl, Maznevski, Voight, & Johnsen, 2010). The longer the team is operating together, the more often a team is running smoothly and automatic (Stahl et al., 2010).

Interdependence

Most research focused on team inputs have focused and distinguished between different types of teams based on the type of task, length of time a team is operating and the context in which teams work (Chen, 2005). A key element of teams when considering the definition of Kozlowski and Bell (2003) on teams is interdependence. They found three forms of interdependence, namely input interdependence, process interdependence and outcome interdependence. Input interdependence is focused on the level of interaction between team members based on their individual skills and the willingness to which team members must share resources and technologies (Wageman, 1995). The degree to which individual team members have to work together instead of independently to perform as task is called task interdependence (De Jong, Dirks, & Gillespie, 2016). When there is a high task-interdependence than all the team members are dependent on each other to finish the task (Vidyarthi, Singh, Erdogan, Caudhry, Posthuma, & Anand, 2016). When the team members have to work tightly together than distinctive work arrangements will result in a less effective performance (Vidyarthi et al., 2016). The high task-interdependence results in more interactions and close coordination of individual team members' actions and work timing (Vidyarthi et al., 2016). Process interdependence is based on how work in an organisation is structured (Mathieu et al., 2008). Outcome interdependence is important, because it focuses on the feedback and rewards linked to the team performance that is used to motivate team-oriented behaviour (Campion, Medsker, & Higgs, 1993). Mathieu et al. (2008) have been able to indicate that interdependence influences the functioning of a team. In the past, interdependence was observed as being a source of inefficiency and errors (Mathieu et al., 2017). Now-a-days, the greater collaboration between team members is associated often with a greater chance of achieving collective organisational goals and competitive advantage (Day et al., 2004). According to Salas et al. (2004) interdependence is thought to include task interdependence, goal interdependence and feedback/rewards.

Individual Characteristics

Historically seen, individuals have been very important for organisations. In the first half of the 20th century, most of the personnel decisions and actions revolved around individuals (Neuman, & Wright, 1999; Mathieu et al., 2017). Team members are an important factor in measuring team effectiveness, because they possess different self-interests which will not align with the objective set by a team (Courtright, McCormick, Mistry, & Wang, 2017). The environment in which individual team members operate can be described as a bounded interactive context, which is created by attributes, interactions and responses possessed by the individual team members (Kozlowski, & Bell, 2003). Kozlowski and Bell (2003) stated that abilities and personalities are psychological characteristics of individual-level constructs. Because teamwork is characterised by interactions, interdependencies and resource sharing, each team does relay on the alignment of team members interests and team objectives (Courtright et al., 2017).

Attributes of individuals operate interactively and reflexively based on characteristics and behavioural characteristics of the other team members (Hambrick, Davison, Snell, & Snow, 1998). One of the attributes of team is the personality of individual team members (Mathieu et al., 2008). Attributes are responsible for the feelings, thoughts and behaviours of individuals (Sogunro, 1998). The effectiveness of software development teams depends for a large extent on the interaction of the individual team members (Maheshwari, Kumar, & Kumar, 2012). According to Schlechtdahl et al. (2015) are all participants in an 'Industry 4.0' environment interconnected an able to share information with each other. Fine (1971) found that organisations that lack stable face-to-face teams have declined interpersonal communication, interpersonal influence and group-oriented methods of team supervision is difficult to implement. Furthermore, there would be a decrease in decision making capacities, performance goal setting, motivation, group loyalty and in the end even dropped levels of productivity, earning, satisfaction, and mental health of the employees (Fine, 1971). In the 'Industry 4.0' environment it is important that there are frequent interactions between shareholders, agents and participants (Götze, & Jankowska, 2017). Day et al. (2004) mention in their research that multiple researchers have found individuals that are willing to work with a collective orientation and are willing to develop a shared social identity to improve team effectiveness.

2.2.2. Processes

The 'Industry 4.0' literature has been focused especially on the technical changes that it encompasses, there is not much information to be found on team processes, mediators and outcomes. This research will be one of the first researches to focus on the effect of 'Industry 4.0' and teams. The next sub-headings will therefore contain prior gained knowledge on the variables belonging to team processes to provide an understanding of how this research perceives the different processes.

The success of a team is not only achieved by the individual team members' talents and the available resources within an organisation (Marks et al., 2001). When the above described input factors are combined than they will drive team processes which are interactions between team members directed to achieve a goal (Mathieu et al., 2008). Processes are important, because they are responsible for developing an effective social system (Cummings, 1978). These processes provide the understanding of how team inputs are changed into outcomes (Marks et al., 2001). Thus, how loosely aggregated individuals are transformed in well integrated and problem solving teams (Cummings, 1978). Marks et al. (2001) define team processes as "members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioural activities directed toward organizing taskwork to achieve collective goals" (p. 357). This means that team processes are individual team members interacting with the other team members and with the task environment (Marks et al., 2001). Furthermore, it are the means that enable team members to work independently using various resources (Marks et al., 2001). Even though, it has been argued that processes are very important for creating successful teams, this academic field is characterised by being fragmented (Mathieu et al., 2008).

Historically, team processes were divided in taskwork and teamwork (Stout, Cannon-Bowers, Salas, & Milanovich, 1991). Taskwork describes what teams are doing and teamwork describes how the individual team members are interacting with each other (Marks et al., 2001). This means that taskwork is fundamental to team effectiveness and depends on team members competences and team processes. These team processes are important to direct, align and monitor the taskwork (Marks et al., 2001). To sum up, teamwork processes, team processes are the interdependent activities that arrange the taskwork used to achieve the goals (Marks et al., 2001). The teamwork processes are responsible for the transformation of team inputs to proximal and longer-term outcomes (Marks et al., 2001). Marks et al., (2001) developed a hierarchy of team processes that can be divided in three superordinate categories: transition, action and interpersonal. A distinction can be made between the transition phase and action phase, though in reality they often blend together (Marks et al., 2001). Furthermore, the interpersonal phase occurs during the transition phase and action phase and provides the foundation for effective processes (Marks et al., 2001).

Transition Phase

For teams it is important that they have an understanding of the larger work environment in which a team is operating, developing their strategies and contingency plans and producing clear goals (Marks et al., 2001). The transition phase is characterised by activities as the mission analysis, planning, goal specification and strategy formulation (Mathieu et al., 2008). This transition phase is responsible for setting the stage for future actions (Marks et al., 2001). Thus, during this phase, the team is focused on evaluating or planning different activities that will guide the team in completing their goals (Marks et al., 2001). This phase is the moment for teams to make an inventory on how well they have been performing and preparing for the following activities to come (Marks et al., 2001). This means that during this phase performance gaps can be found and closed (Marks et al., 2001).

Mission Analysis

"Mission analysis is the interpretation and evaluation of the team's mission, including identification of its main tasks as well as the operative environmental conditions and team resources available for mission execution" (Marks et al., 2001, p. 365). The mission analysis is driven by verbal discussions which will ensure that the team members have a shared vision of the purpose and objective of the team and the interpretation occurs cognitively when team members understand their attribution in the team with the boundaries of the abilities of the team, resources and time constraints (Marks et al., 2001). There are two types of mission analysis, namely backward evaluation and forward visioning (Marks et al., 2001). Backward evaluation includes the diagnoses of previous performance of the team and interpreting the reasons of the success or failure of the team (Marks et al., 2001). The teams own interpretation of its attribution in the future of the ongoing events is forward visioning (Marks et al., 2001).

Goal Specification

"Goal specification refers to the identification and prioritization of goals and subgoals for mission accomplishment" (Marks et al., 2001, p. 365). When a team is focusing on the goal specification, they are in the process of developing and assigning the overall mission goals and sub-goals, deciding on time periods in which tasks must be accomplished and what the quality standard needs to be (Marks et al., 2001). In an ideal situation, goals are aligned with strategies and timelines are related to mission accomplishment (Marks et al., 2001). When goals are poorly conceptualised, because they are general, vague, conflicting, unambiguous, unattainable or impractical or not valued by the team, then they do not provide effective strategies, timelines and collective activities and do not stimulate effective performance (Marks et al., 2001).

Strategy Formulation and Planning

"Strategy formulation and planning refer to the development of alternative courses of action for mission accomplishment" (Marks et al., 2001, p. 365). When a team has been able to develop a good strategy it includes a consideration of the situation constraints, time constraints, team resources, team member expertise, and the adaptability of the teams' environment (Marks et al., 2001). The information in these strategies is about team members roles and responsibilities, the timing and order of different actions, and how task-related activities are expected to be executed (Marks et al., 2001). A team has a poor strategy when they are unable to create plans for the successful execution of goals and teams have to rely on past experience or improvise (Marks et al., 2001). Marks et al. (2001) distinguish between three planning subdimensions: (1) deliberate planning, (2) contingency planning and (3) reactive strategy adjustment. Deliberate planning is the beginning of an episode and is the formulation and transmission of the primary course of action for the mission execution (Marks et al., 2001). Contingency plans can be used to react to anticipated adjustments in the performance environment by distributing and formulating priori alternative plans and strategies (Marks et al., 2001). A differentiation between deliberate planning and contingency is made to show the importance for teams to prepare ahead for anticipated changes in the teams environment (Marks et al., 2001). A good contingency plan can be recognised, because it is build according to the 'if/then logic' that is tied to multiple 'trigger events' (Marks et al., 2001). Then, there are also moments in which unexpected events can occur in the action phase or errors are found in the initial strategy which means there is a need for a strategic change (Marks et al., 2001). This is when organisations can adopt a reactive strategy adjustment (Marks et al., 2001). "Reactive strategy adjustment is the alteration of existing strategy or plans in response to unanticipated changes in the performance environment and/or performance feedback" (Marks et al, 2001, p. 366). An effective team can decide on the fly to reconsider, abandon, or adjust plans that have been made originally with the deliberate planning and contingency planning (Marks et al., 2001). Thus, teams should have the ability and opportunity to change their originally planned strategies in the action period (Marks et al., 2001).

Action Phase

In the action phase, team members are focused on accomplishing the task, monitoring processes and systems, coordinating, monitoring and backing-up the other team members (Mathieu et al., 2008). In other words, they are engaged in acts that directly influences the chance of completing the goals of the team (Marks et al., 2001). Processes in this phase are often coordinating and monitoring processes (Marks et al., 2001).

Monitoring Progress Toward Goals

When teams are participating in monitoring team progress towards a goal than they are tracking the task of individual team members, the team and the progress they make in accomplishing the goal (Marks et al., 2001). This is done by interpreting information about what resources are needed to reach the goal and by transmitting made progress towards all the individual team members (Marks et al., 2001). According to Day et al. (2004) recent research has shown that effective teams exist of team members that have an understanding of the teams functioning. It is, thus, important that there is enough feedback that team members know the status of the goal accomplishment, so that team members can decide if their progress and their likelihood of success are still in the given period of time (Marks et al., 2001). So, when goals are monitored it does not only mean that progress is detected, but it is also about the transmission of the information to team members (Marks et al., 2001). When goal monitoring is faltering than teams will glide, stall or stray off their task which causes them to loose track of their goal for a longer period of time (Marks et al., 2001). This, furthermore, means that teams are not able to have appropriate feedback within the team (Marks et al., 2001). When team member are engaged in monitoring activities, they will be able to detect overloads of inefficiencies and step in to be able to assist (Day et al., 2004). It can be expected that participants in an 'Industry 4.0' will provide direct feedback of production conditions, because of the available real time data on smart phones and tablets (Sanders et al., 2016).

Systems Monitoring

According to Marks et al. (2001) systems monitoring refers to 'tracking team resources and environmental conditions as they relate to mission accomplishment; it involves (1) internal systems monitoring, tracking team resources such as personnel, equipment, and other information that is generated or contained within the team, and (2) environmental monitoring, tracking the environmental conditions relevant to the team' (p. 367). An effective team will manage their environment by constantly observing changes that occur in the internal and external environment in which they perform (Marks et al., 2001). This is done by monitoring critical information (Marks et al., 2001). When poor systems are adopted than teams make erroneous interpretation of the information in the internal and external information of the team (Marks et al., 2001).

Team Monitoring and Backup Responses

This process can be defined as "assisting team members to perform their tasks, which may occur by (1) providing a teammate verbal feedback or coaching, (2) assisting a teammate behaviourally in carrying out actions, or (3) assuming and completing a task for a teammate" (Marks et al., 2001, p. 367). Thus, these are supportive actions performed by other team members (Day et al., 2004). This process includes giving feedback, task-related support

and seeking help (Marks et al., 2001). For team monitoring and backup responses to be effective, every individual in a team needs to be informed about the other team members' role to be able to identify when assistance is needed (Marks et al., 2001). A team will fail when the team members are not looking out or willing to support the other team members, because a team will not be successful when one of the team members cannot be successful (Marks et al., 2001).

Coordinating Activities

When a team is coordinating activities, they are "orchestrating the sequence and timing of interdependent actions" (Marks et al., 2001, pp. 367-368). Most often coordinating happens during the action phase, but it can also happen during the transition phase (Marks et al., 2001). Coordinating problems exist when teams describe situations characterised by communication breakdowns and team members who get out of sync with the rest of the team (Marks et al., 2001).

Interpersonal Phase

During the interpersonal phase, conflict management, motivation, confidence building and affect management are addressed (Mathieu et al., 2008). The interpersonal phase is very important, because when breakdowns occur in this phase, interpersonal relations will be affected which can lead to less effective monitoring, backing-up behaviours of the other team members and can cause different types of coordinating problems (Marks et al., 2001).

Conflict Management

Disagreements and/or conflicts between managers and employees can be described as common and even inevitable in all organisations (Korsgaard et al., 2002). Marks et al. (2001) use two types of conflict management that can reduce conflict in a team. These types are pre-emptive conflict management and reactive conflict management. When using pre-emptive conflict management teams try to prevent, control or guide conflicts in teams before they occur by establishing conditions (Marks et al., 2001). Thus, this type of conflict management is focused on solving conflicts before they occur (Marks et al., 2001). Reactive conflict management can be characterised by team members solving task, process and interpersonal disagreements when they occur (Marks et al., 2001). Disagreements and/or conflicts are negative events in organisations causing them to have problems in building trust and cooperative relationships (Korsgaard et al., 2002). Two different types of conflicts can observed, namely relational conflicts and task conflicts (Curşeu, 2006). Task conflict is beneficial to teams, because it increase the quality of the discussions and the acceptance of the decision or satisfaction of the team outcome (Curşeu, 2006). Relational conflict, on the other hand, has a negative influence on the team, because of reduced satisfaction and commitment to the team (Curşeu, 2006). When there are interaction based on opposed individual views then there will be no disruptive conflicts (Curşeu, 2006). Though, interactions between opposing group values does create high levels of conflict (Curşeu, 2006).

Motivating/confidence Building

"Motivating and confidence building involve generating and preserving a sense of collective confidence, motivation, and task-based cohesion with regard to mission accomplishment" (Marks et al., 2001, p. 368). This means that when a team is focused on motivating and confidence building that they are encouraging the team members to have an improved performance or to maintain their levels of performance (Marks et al., 2001). A team is showing motivating behaviours when team members communicate about their belief is the abilities of the team, competences on particular tasks and when feedback is given on the success of the team (Marks et al., 2001). Teams can also see their motivation and/or confidence and task cohesiveness deflate, because of negative comments on the teams or individual team member competences (Marks et al., 2001).

Affect Management

"Affect management involves regulating member emotions during mission accomplishment, including (but not limited to) social cohesion, frustration, and excitement" (Marks et al., 2001, p. 369). There are techniques teams can use to regulate team members emotions, namely calm team members down, control frustration levels, boost team morale and team cohesiveness among team members and use empathy (Marks et al., 2001). Joking, relaxing and complaining are activities in teams that are considered to be affect management when it breaks tension, vents frustration and/or manages stressful situations (Marks et al., 2001). Though, these activities need to be managed in a good way, because ineffective use will lead to an increased negative affect, wasted time and performance problems (Marks et al., 2001).

2.2.3. Emergent States

There are some disagreements about what emergent states are. According to Ilgen et al. (2005) emergent states are together with processes mediation processes that give and explanation about the effect some inputs have on team effectiveness and viability. Curşeu (2006) define emergent states as variables "that describe the team as a whole, and they emerge from and in the same time shape the local dynamics of the team" (p.251). Emergent states emerge over time (Mathieu et al., 2008). They emerge, because of social interactions among the different team members Curşeu (2006). Marks et al. (2001) referred to cognitive, motivational and affective states of teams when discussing the emergent states. They indicate that the difference between team processes and emergent states is that team processes are interactions and emergent states are "constructs that characterize properties of the team that are typically dynamic in nature and vary as a function of team context, inputs, processes, and outcomes" (p. 35). Thus, emergent states are not team interactions or action that are necessary for team outcomes, but they are team experiences that become new inputs to ulterior processes and outcomes (Marks et al., 2001). There are different emergent states observed in past research. Mathieu et al. (2008) have observed the following emergent states; team confidence, empowerment, cohesion, trust and collective cognition to be the most researched emergent states. The process of emergence is often debated in association with self-organization (Curşeu,2006).

Team Confidence

Team confidence is an emergent state that includes two distinct and related variables, namely team efficacy and potency. Team efficacy can be described as "a shared belief in group's collective capability to organize and execute courses of action required to produce given levels of goal attainment" (Kozlowski, & Ilgen, 2006, p. 90). The difference between the two constructs is that efficacy relates to the team's belief that the team can perform successful on a specific task (Mathieu et al., 2008). Both constructs are theorised to positively impact performance through the effect these emergent states have on the actions teams take, their level of effort, and optimism when the task performance does not accomplish the expected level (Mathieu et al., 2008).

Team Empowerment

Mathieu, Gilson and Ruddy (2006) and Curşeu (2006) found that team empowerment exists of two conceptions. These conceptions are structural and psychological. The psychological empowerment of a team means the team collective beliefs they are in control of their own proximal work environment and team functioning (Mathieu et al., 2006). When considering this conception of cohesion, cohesion is related with team processes, team outcomes and the other emergent states (Curşeu, 2006). Arnold, Arad, Rhoades and Drasgow (2000) found that structural empowerment deliberates over the impact of the how the authority delegating practice in the organisation influence team performance. It implies that teams "are nested structures and highly cohesive teams are embedded in less cohesive ones and the features and properties of a highly cohesive team are beyond any individual actor in the team" (Curşeu, 2006, p. 256). Cohesion is a synonym of the commitment team members have to the overall task of the team or to the individual team members (Goodman, Ravlin, & Schminke, 1987). So, the key component of this construct is interpersonal attraction between team members (Darley, Gross, & Martin, 1952). This emergent state is one of the most thoroughly researched (Kozlowski, & Ilgen, 2006). Furthermore, cohesion from the beginning on has been viewed as an emergent state, because it arise among teams through team member interactions, the attitudes they have towards each other or the prestige the team gains (Curşeu, 2006). Beal, Cohen, Burke and Mcledon (2005) found three dimension of cohesion, namely interpersonal, task and group pride, that significantly relate to team effectiveness. To conclude, cohesion emerges from team processes and influences individual team members and the team.

Trust

For organisations that are transforming, it is very important that there is mutual trust (Götze, & Jankowska, 2017). According to Mathieu et al. (2008) the most adopted definition of trust is the one given by Mayer, Davis and Schoorman (1995): "The willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control the other party" (p. 712). The forming stage of the team is important for the emergence of this emergent state (Curşeu, 2006).

Team or Collective Cognition

Past research on team or collective cognition (hereafter referred to as collective cognition) was directed on mutual nature of individual knowledge structures of individual team members within the team (Curşeu, 2006). This collective cognition is a representation of information that has through the use of communication been stored in the team's long-term memory (Curşeu, 2006). The emergence of collective cognition starts with the individual schemata used by the individual to make sense of a distinct knowledge domain (Curşeu, 2006). In other words, it is the shared perception in teams about a particular domain (Langfield-Smith, 1992). These schemata are important, because they shape the individuals behaviour and support the interpretation of the behaviours of the other team members (Curşeu, 2006). Individuals interact based on coordination mechanisms that are enforced by the team (Curşeu,2006). The individual schemata are adjusted, because of repetitive interaction (Curşeu, 2006). The same happens with collective cognition, though collective cognition does reach a consensus (Curşeu, 2006). When this consensus is reached than the team is in a state of equilibrium which reflects the actions of a team (Curşeu, 2006). Even though, collective cognition is not made of a dynamic process of the co-evolution of individual schemata, but it cannot be diminished to a sum of individual schemata (Curşeu, 2006).

Adaptability

Teams are able to adapt when team members participate in mutual performance monitoring and back-up behaviours (Day et al., 2004). "Adaptability refers to the ability to recognize deviations from expected actions and readjust actions accordingly" (Day et al., 2004, p. 864). This quality makes teams valuable to organisations, because it would mean that teams are able to allocate resources, self-correct and redistribute workload in response to changes in the organisational and external environment (Day et al., 2004). Adaptability is the opposite of predictability which has been the basis of the traditional approach (Jovanović, Lalić., Mas, & Mesquida, 2015). Day et al. (2004) have articulated team leadership capacity to be an emergent state since it develops over the lifetime of a team.

2.2.4. Outcomes

As explained in this theoretical framework, one of the most important outcomes of 'Industry 4.0' is the realisation of a batch size that equals 1 as put forward by the definition of Basl (2017). There are different forms and combinations of team effectiveness which makes it more difficult to measure team effectiveness (Mathieu et al., 2008). Cohen and Bailey (1997) found three categories of team outcomes, namely performance, attitudes and behaviours.

"Performance means acceptability of output by the customers within or outside the organization who receive team products, services, information, decisions, or performance events" (Sundstrom et al., 1990, p. 122). Performance criteria are "(a) carefully tied to the function and task of the teams being studied, (b) differentiated into constituent parts (e.g., quality, quantity, or customer satisfaction) rather than a general all-encompassing composite, and (c) combined using a formally articulated combination algorithm" (Mathieu et al., 2008, p. 418). In the 'Industry 4.0' environment solutions should be characterised by being multilateral which means

interoperability was reached and there was a fulfilment of diverse requirements from multiple partners (Lu, 2017). In Germany, they expect 'Industry 4.0' to inspire immense growth together with increased export and innovation performance of machine tools, plant equipment and motor manufactures (Pfeiffer, 2017). The literature on 'Industry 4.0' was not able to give an understanding of what attitudes and behaviours are expected as outputs of team effectiveness in the new working environment.

2.3. Importance of research

'Industry 4.0' is especially in Germany the new organisational environment. Prior knowledge and information that has been gained on this topic has mostly focused on the technologies that are necessary for establishing the environment and what the expected effects are of these technologies. Though, the organisational change needed for this new environment introduction has mostly been overlooked. As displayed above, there have been assumption made about expected structures within the 'Industry 4.0' environment. Thus, the autonomous systems that has been proposed by multiple researchers. Though, there has not been a research that has focused on the best practices of employees that have experience with working in a teams in the 'Industry 4.0' environment. Therefore, this research focused on the experiences, feelings, attitudes and opinions of employees of a German organisation involved in participating in the new environment. This should result in pain points and best practices that can be used by practitioners to improve the team environment in the 'Industry 4.0' environment.

3. Methodology

The purpose of this research is to find how organisations transferring to the 'Industry 4.0' environment can establish team effectiveness. To answer this research question two rounds of semi-structured interviews were held in a German case-organisation. The methodology chapter will describe the research design, case-organisation, data collection, data sources, the research procedure and the participant groups.

3.1. Research Design

This research has been developed in request of a German organisation currently engaged in participating in the new 'Industry 4.0' environment. Due to this request, this research is a process case study. Process research is defined by Bizzi and Langley (2012) as an examination of events, activities and choices which emerge and sequence over time. In other words, process research is focusing on evolving phenomena and "draws on theorizing that explicitly incorporates temporal progressions of activities as elements of explanation and understanding" (Langley et al., 2013, p. 1). This type of research focuses on important questions which impact the heart of management and the organisational life which can be observed in every organisation (Langley et al., 2013). Studying processes means that a strong process ontology is adopted that focuses on how activity flow is continually reconstitute expected stable phenomena as for example organisations, structures, cultures and identities (Bizzi & Langley, 2012). This process research is conducted within a real life case environment. A case study allows for an improved understanding of the phenomenon studied (Baarda et al., 2013). It is a methodological tool that enables researchers to receive an improved understanding of processes within and around organisations (Bizzi & Langley, 2012; Langley, Smallman, Tsoukas, & Van de Ven, 2013). A process research is done in retrospect (Bizzi, & Langley, 2012). This means that the case-organisation has observed a situation that can be described as not being optimal which they want to understand more completely. The observation done by the case-organisation provides input for the method chosen within this research which focuses on looking at historical events to understand the observed situation.

As described in the theoretical framework, this research is based on a well-developed idea of team effectiveness. However, knowledge on how this team effectiveness can be established in the 'Industry 4.0' environment is lacking. Therefore, this research also has a descriptive character of a social phenomenon. Descriptive research enables descriptions of specific details of the situation, social setting and/or relationship in the case-organisation (Neuman, 2014). This type of research is focused on "how" and "who" questions (Neuman, 2014). Since, it is a descriptive research of a social phenomenon a social phenomenology is used in this research. "Social phenomenology takes the view that people living in the world of daily life are able to ascribe meaning to a situation and then make judgements" (Fereday & Muir-Cochrane, 2006, p. 81). This means that reality is designed by the perspective of individuals, which is the essences of the interpretivism paradigm (Wahyuni, 2012).The reality is constructed on the background, assumptions and experiences of different employees and their social interactions (Wahyuni, 2012). Therefore, the research uses an insider perspective (axiology; Wahyuni, 2012).

3.2. Data Collection

One of the primary goals of this research is to provide practitioners with knowledge on how transferring organisations into the 'Industry 4.0' environment can establish team effectiveness. This research is therefore an applied research with an evaluation research, the tool used in this research is a need assessment. This kind of research is done in an organisation that have implemented new ways of doing things and want to know the effectiveness of this new situation (Neuman, 2014). Furthermore, this research is focused on collecting data containing major social needs and the severity of the sample (Neuman, 2014).

To collect the data, two rounds of semi-structured interviews were conducted. Semi-structured interviews are a form of qualitative research (Neuman, 2014). Interviews is a method that provides participants with the possibility to express their memories and connect temporal phenomena over time (Bizzi & Langely, 2012). The unique strength of this method is that it provides the research with access to the internal life of the employees of the case-organisation (Bizzi & Langely, 2012). It is a method that uses a bottom-up approach (Watts, Todd, Mulhearn, Medeiros, Mumford, & Connelly, 2017). The conducted interviews have been based on a new developed interview guide (Appendix A and B). This guide has been used to support the interviewer within the interview sessions, but it provides the interviewer with the freedom to have a conversational interview and ask the questions in a non-specific order.

3.3. Data Sources

This research focuses on capturing how team effectiveness can be established in organisations that are transforming to the 'Industry 4.0' environment. Therefore, the theoretical framework focuses on an extensive overview of knowledge on 'Industry 4.0' and team effectiveness. Figure three gives an overview of all the different variables discussed in the theoretical framework. As discussed in the theoretical framework, not much is known about the consequence of transferring organisations to an 'Industry 4.0' environment on team effectiveness. To provide a first comprehensive overview of the consequences all the different effectiveness variables (inputs, mediators and outcomes) are considered within the interview guides.

The first round of interviews was conducted to provide a general overview of experiences of the participants of their positive experiences and negative experiences in teams that represented the 'Industry 4.0' projects of the case-organisation. The interview guide (Appendix A) was focused on all three of the different categories of the IMOI model. This means that the interview guide of the first round of interviews were focused on the variables of the input, mediator and outcome categories. The different variables are represented in figure three. Based on all this knowledge the interview guide was constructed. Furthermore, since researchers have not yet been able to reach a consensus on a definition of 'Industry 4.0', the participants were asked to define 'Industry 4.0'. They were also asked for their opinion about autonomous teams. These questions were asked to acquire an understanding of employees which are experiencing the changes.

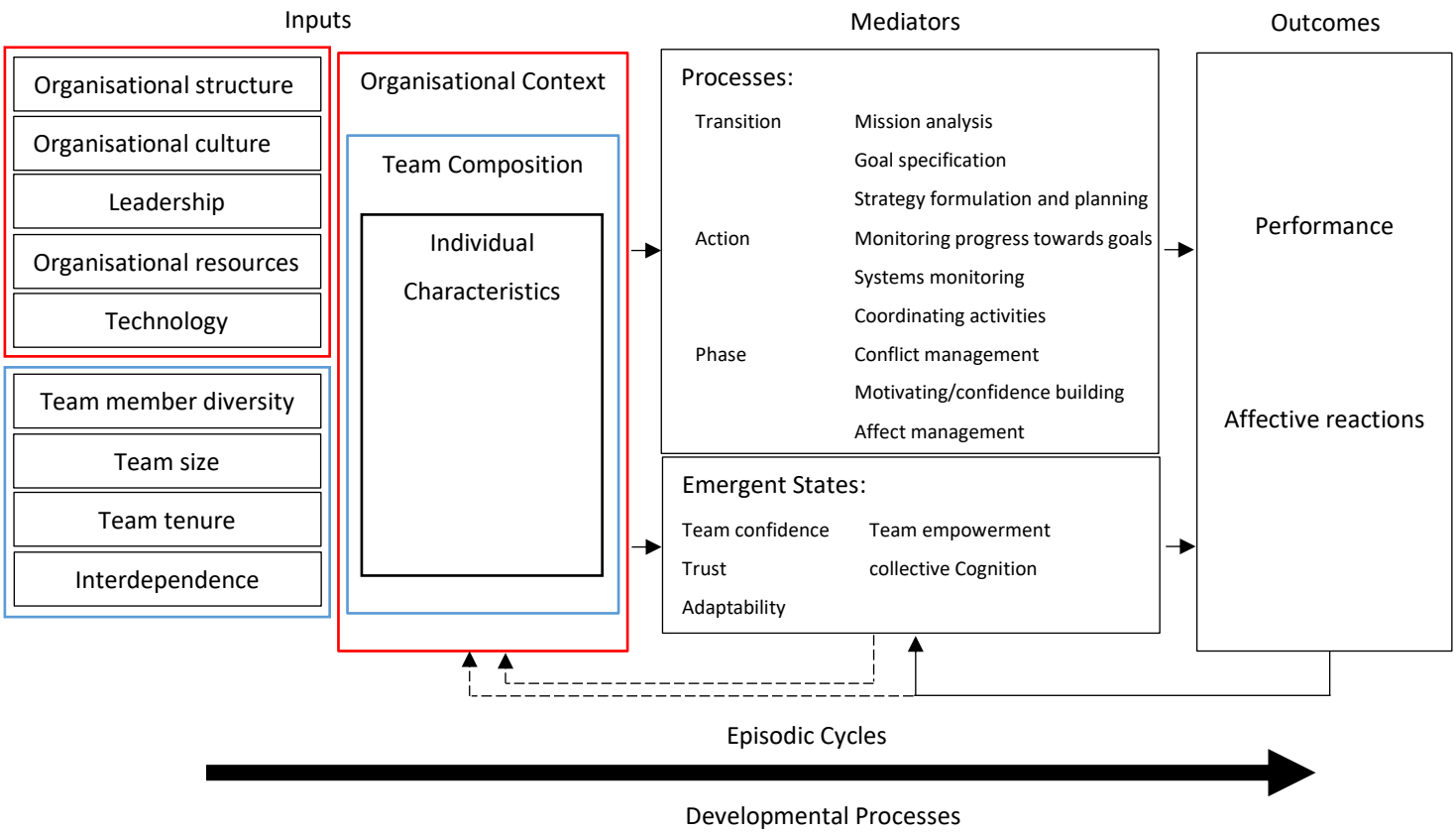

Figure 3. A schematic overview of the variable used in this research. The inputs have been captured in two tables. The different colours shown in the inputs group indicate how the bigger constructs organisational context and team composition are made of.

The second interview guide (Appendix B) was constructed based on the findings of the first interviews. Since the first experience has been gathered there was an improved understanding of the experience of employees in the organisation. This resulted in some unclearn points and interesting findings that could use more support. The questions that arose when analysing the first round of interviews were used as inputs for the second interview guide.

To analyse the data, four codebooks have been created based on the information found in the theoretical framework. The codebooks are present in tables 1-4 and are used to analyse the data gathered from the two rounds of interviews. These tables represent code 1 till 13. Furthermore, participants were asked about how they would define 'Industry 4.0' and if they thought if autonomous teams could provide a solution for an improved team effectiveness. These answers have also been coded (code 14 and code 15). Additionally, many participants mentioned that the organisation adopts Agile and/or SCRUM methods. Because the above provided codes do not cover methods already used within the case-organisation, a new code, code 16, was developed. The inter-reliability has been calculated by using Cohen's Kappa which is the most widely used inter-rater reliability index (Gisev, Bell, & Chen, 2013). The second coder analysed one summary and one transcription of the second interview round. The inter-rater reliability was 0.74 (Appendix C). According to Neuendorf (2002) the acceptance standard is a score of 0.7. This means reliability of the codebooks has been established.

Table 1

Codebook input dimensions team effectiveness

Input Dimensions	Definition of Dimensions	Codes
1. Organisational Context	The organisational context is formed by decisions made in a higher level of management that effects teams with individuals in their interactions, use of resources and their behaviour.	• Available resources • Form of leadership • Technological tools used to transform inputs into outputs • Building blocks of the organisation • Observed entity who has responsibility and authority • Believes and values within the case-organisation
2. Team Composition	Teams are embedded in the organisational context and differ, because of different social and psychological progresses in teams.	• The extent of differences between the different team members of a team • Size of the team • Lifespan of the team • The extent to which team members are depending on each other to fulfil their task • The extent to which team members are depending on the structure to get the task fulfilled • The extent to which team members are depending on feedback and rewards to be motivated
3. Individual Characteristics	Individual attributions, interactions and responses that influence other team members.	• Feelings, thoughts and behaviours of individual team members • The extent of interconnectivity between individual team members • The influence of reactions of team members

Table 2

Codebook process dimensions team effectiveness

Process Dimensions	Definition Dimensions	Codes
1. Transitions Phase	The assessment of the organisational mission analysis, planning, goal specifications and formulating strategies.	• The shared vision of the purpose and objective of the team when team members understand their attribution to the team • The identification and prioritisation of goals and sub-goals • The development of alternative course of action for mission accomplishment
2. Action Phase	The assessment of task accomplishment, monitoring progress/systems and coordinating team members.	• Tracking of task and progress by interpreting information about what is needed to accomplish the goal and to transmit progress • Tracking team resources and environmental conditions that relate to mission accomplishment • Give feedback, task-related support and seeking help • Orchestrating the sequence and timing of interdependent actions
3. Interpersonal Phase	The assessment of conflict management, motivation and confidence building and affect management in the organisation.	• Disagreements and/or conflicts between managers and employees • Disagreements and/or conflicts between team members • Generating and preserving a sense of collective confidence, motivation, and task-based cohesion connected to the mission accomplishment • Regulating member emotions

Table 3

Codebook mediator dimensions team effectiveness

Mediator Dimensions	Definition of Dimensions	Codes
4. Team Confidence	Level of understanding of how capabilities of the team relate to performing a successful task or the shared belief that the team has the capabilities to organise and execute the course of actions to make a team successful.	• Believe that the other team members can fulfil their task • Believe that the team has all the capabilities to fulfil the task
5. Adaptation	The extent to which teams are willing to accustom to or accustom for.	• Sharing of workload • Providing back-up when there is a high demand
6. Trust	The extent to which team members are willing to be vulnerable.	• Willingness to be vulnerable • Expectations about how other parties will operate
7. Cohesion	The commitment of the team members.	• The amount of effort team members put into the team
8. Team Empowerment	The combination of structural empowerment and psychological empowerment.	• The collective believe that the team has control over their work environment • The collective believe that the team has control over the team functioning
9. Collective Cognition	The shared perception of team members in a team about a certain domain.	• Shared norms

Table 4

Codebook outcome dimensions team effectiveness

Outcome Dimension	Definition of Dimensions	Codes
10. Team effectiveness	Explains what is regarded as a successful and unsuccessful team outcome.	• Actions focused on achieving outcomes • Acceptability of customers of the outcome

3.4. Case-organisation

The case-organisation of this research is a multinational organisation that is headquartered in the South of Germany. The case-organisation can further be described as a business-to-business organisation which operates in the technical industry and the software industry since the introduction of the new division. The case-organisation is also characterised by being family-owned. Furthermore, they operate in an international environment and employ about 19.000 employees that operate in over 60 different countries. The organisation could be described as being diversified. A diversified organisation is an organisation that operates in different businesses (Ganzarian & Errasti, 2016). Currently, the case-organisation exists of four divisions. Three of these divisions have existed for multiple decades and the fourth division has been established in more recent years. The case-organisation of this research is characterised by its product diversification and external geographical diversification (Ganzarian & Errasti, 2016). The case-organisation is characterised by product diversification, because all the four divisions work in different industries. The three longest existing divisions all operate in different technological industries and the fourth and youngest division is mainly focused on developing software. Furthermore, the organogram of the organisation showed a hierarchical structure.

This case-organisation has multiple characteristics that made this organisation suitable for researching team effectiveness in the 'Industry 4.0' environment. The headquarters of the organisation is based in Germany, the country in which 'Industry 4.0' found its origin. Additionally, it is the country in which the economy is shaped by engineering and industry (Pfeiffer, 2017). It can be assumed that it is therefore more likely that organisations in Germany experience more need for transferring their organisations than countries whose economy is not primarily shaped by engineering and industry. Furthermore, the organisation has a rich history based on the development of multiple products before the organisation gained the desire to explore 'Industry 4.0', making it an transitioning organisation. Additionally, the case-organisation represents an organisation with a hierarchical structure. This was mentioned to not provide teams in the new 'Industry 4.0' environment with more effectiveness.

The case-organisation used to exist of isolated, decentralised IT units throughout the different divisions within the organisation. Through technical interconnectivity and business process interdependence an internal integration process was started (Agarwal & Brem, 2015). This has had multiple consequences for the employees working for the organisation. Quite a large amount of employees of the already existing three divisions had to be reassigned to the new division. Furthermore, part of the production of products that was done in the existing divisions became products from the new divisions. This meant that the existing division lost essential resources and products. On the other hand, the new division was not able to start in a greenfield, because of the products they got a responsibility for and the fact that the new divisions is mostly built on already hired employees by the organisation. The new situation makes the organisation more dependable on the cooperation between division by the use of teams. This situation represents a perfect case to research how team effectiveness is perceived in a transferring 'Industry 4.0' environment.

3.5. Participants

This research used participants since the aim of the research is to get opinions of individuals participating in the research environment (Baarda et al., 2014; Neuman, 2014). The participants in this research were chosen using criterion sampling. This means they were selected, because they had experience with the phenomenon that is studied, but all possess different characteristics and experiences (Moser & Korstjens, 2018). Of the 19 employees that were approached for the first round of interviews, 18 employees were able to participate. Two of the originally approached participants indicated that they were not able to participate. During one of the interviews of the first round, an approached participant invited a colleague to join the interview session, because of the employees knowledge on the topic. Though this was another situation compared to the situations of the other interviews. The interview only took longer, but provided a lot of useful knowledge. Most of the participants in this first round of the interview were male (16 participants) and two were female. Though observing the demographics of the case-organisations as often mentioned by the participants most employees are male. Seron, Silbey, Cech, and Rubineau (2018) found in their research that women are still underrepresented in the technology sector. These participants represent a broad range of ages. All the participants are white-collar professionals. These are employees working as engineers, designers and programmers who collaborate in projects that are assigned or originate from them (Sundstrom et al., 1990). These employees often work on outputs that are complex and unique (Sundstrom et al., 1990). Furthermore, all the participants of the first round of interviews represented all the different divisions within the organisation.

The second round of interviews was a smaller sample of the original participants that had participated in the first round of interviews. These seven participants represent two female employees and five male participants. The participants of the sample for the second round of interviews were chosen, because they represent the different divisions within the organisation. Since the first round of interviews showed that some participants within the same division had different working circumstances. Therefore, one participant was asked to participate in the second round of interviews, because this participant worked as one of the few employees in an open work space. Including this employee made sure that the interviews would take as many different perspective into account as possible.

Thus, in total this research was based on the perspectives of 19 employees in total. The initial participants were all contacted by organisations supervisor of this research. All the participants have been participating in teams that were involved in 'Industry 4.0' projects. Some of the participants were even involved in the projects that lead up to the development of the new division. Furthermore, all the participants involved in the first and second round of interviews were representing the different divisions in the organisations and two different forms of work places available in the organisation. This pool of participants was able to provide the research with the largest possible inclusion of perspectives for this research.

3.6. Research Procedure

Al the participants within this research were initially contacted by e-mail. For the first round of interviews, participants were contacted by an e-mail drafted by the supervisor within the case-organisation of this research (Appendix D). Most of the participants replied by e-mail that an appointment could be scheduled in their Microsoft Agenda's. When sending the appointment request the informed consent form was attached to the appointment (Appendix E). This informed consent form explains the goal of the interview, the rights of the participants and asks the participant for permission to record the interview. Even when the informed consent form was signed by participants, the participants were asked if they did not mind being recorded. During the first round of interviews, three different interview situations could be observed. All these different interviews followed the same interview guide (Appendix A). Though, of the seventeenth interviews, fiver were conducted using Microsoft Lync, the other 12 were done in person and one interview as done with two participants at the same time. In the second round of interviews, seven participants of the first interviews were invited by e-mail for the second round of interviews when they received the summary of their interview from the first round of interviews. Because of a lack in responses, four of the participants were again contacted by e-mail.

Before the start of this second round of interviews, the participants had to read the informed consent form (Appendix F). Again for the purpose of clarity, the participants were asked before the beginning of the interview if they did not mind being voice recorded. Within this round of interviews two different situations can be observed. One of the seven interviews was conducted through Microsoft Lync and the other six were conducted within the proximity of the workplace of the participant. During both the interview rounds a printed interview guide was present. The questions on this interview guide are characterised by their open-ended character. The interviews ended with the question if the participant wanted to discuss something that had not yet been discussed. According to Downs and Adrian (2004) this question can reveal information that might be unexpected but useful for the research.

3.7. Data Analysis

After the interviews were conducted, the interviews were fully transcribed from the available audio. The transcripts of the first interviews were summarised. These summaries were send to the participants to give them the opportunity to provide feedback on them. This feedback was used to correct inconsistencies or interpretations mistakes. The second round of interviews were also fully transcribed, but not summarised. The initial data existed of a lot of references to divisions and colleagues. To make sure that the participants and the case-organisation would stay anonymous and information was being handled confidential. Names of colleagues, divisions of the case-organisation and the name of the case-organisation have been replaced by the consistent use of different phrases (Wahyuni, 2012). In the summaries and transcriptions the names of colleagues were not repeated, the case-organisation was referred to as the German organisation and the names of the different divisions were not used and were replaced by the phrases division 1, division 2, division 3 and division 4. Furthermore, in the summaries words like he or she were avoided. After these changes were implemented the summaries were uploaded in Atlas.Ti8 and they were coded according to the code schemes.

4. Results

The result chapter will outline the analysis of the data gotten from the two rounds of interviews. To secure confidentiality of the participants that have participated in the research all the results will be reported using male references as his or he. The first results that will be discussed are the input results, followed by the processes, mediators and outcomes. The last result discussed in this chapter are based on remarks regarding 'Industry 4.0', autonomous teams and current adopted methods in the case-organisation. The results reported represent the experiences, knowledge, observations and feelings of the participants that have been included in the first and second round of interviews.

4.1. Inputs

The results gathered from the data will be presented in the three input groups that were found in the theoretical framework. Therefore, this paragraph knows the following structure. First the results of the organisational context are discussed, followed by the team composition and finished with the individual characteristics. Table 5 presents the most important findings regarding team effectiveness and 'Industry 4.0' found in the data. These results and more results are further elaborated on in the remainder of the chapter.

Table 5

Important findings of input variables of team effectiveness in an 'Industry 4.0' environment.

Input Variable	Findings
Organisational Context	• The case-organisation is primarily based on old organisational structures as hierarchical structures, appointed leaders and bureaucracy • The growing amount of interfaces has made the organisation more complex • The culture is based on a conservative way of thinking • The product driven strategy of the new division is not based on unique or tailor-made products • Three forms of leadership can be distinguished; appointed leadership, expertise leadership and democratic leadership • A general feeling is that exploitation of the resources is not done effectively • Technologies are important though most facilities are not up-to-date
Team Composition	• The team should represent different ages, capabilities, characters, genders and ethnicity • In the data no optimal team size could be found • There is competition between departments and headquarters which results in contradictory strategies • Recognition and honour are important feedbacks and rewards in this organisation
Individual Characteristics	• Agendas of different departments are influencing thinking and acting of team members • Close proximity between team members is important to facilitate good communication

4.1.1. Organisational Context

The organisational context exists of organisational structure, organisational culture, leadership, organisational resources and technology. Important to notice is that no matter what organisations do, change or implement, these action will influence teams in the organisation. The next sub-heading will discuss findings in the data regarding the variables of organisational context.

Organisational Structure

Though, the case-organisation has had a change in its organisational structure, participant 7 pointed out in his interview that the case-organisation is still characterised by old organisational structures. Participants have indicated that the case-organisation used to exist of three different divisions. These divisions had all their own markets, customers, sales persons and R&D. The fourth division was added about two years ago. This new division has been developed quite quickly according to various participants. According to participant 11 it makes sense from a strategic point of view to transfer the different departments from different divisions doing similar work in one new division. Though, during the development of this new division, a lot of revenues and sales were taken away from the other divisions. As a result, the older divisions lost a large chunk of their business. According to participant 17 this transfer of resources to the new division did feel as a loss and might have caused some distrust. The addition of a new division did not impact the fact that all the longest existing divisions are still focused on their own outputs and markets. It only changed the location of production of the outputs.

This new division has had different effects within the organisation. Participant 16 indicates that within the case-organisation there is a feeling that the new division operates according to their own agenda which is not aligned with the agendas of the other divisions. Special about the new division is that it serves the internal and external market. It is the only division within the case-organisation that is also focused on the internal market. Furthermore, according to participant 1 the new division is also different from the other divisions, because it is focused on providing services and the other division are primarily focused on product development. Besides, the addition of the new division has created more interfaces. However, participant 5 of the second round of interviews indicates “I do not think that the interfaces are that we have too many interfaces. It is not clear enough”. According to this respondent this creates an overlap of responsibilities. This has created a more complex organisation according to participant 17 which resulted in more confusion. The new division is also surrounded by uncertainties. According to participant 12 the focus of the new division is to have a limited time to market. Nevertheless, this is not yet been reached, because there is too much bureaucracy while the new division should portrait a start-up organisation. Moreover, this participant has indicated that the new division is too big, not flexible and Agile as it should be. It is important for the new division to change in order to gain acceptance of the older divisions. This change should focus on realising a successful idea or product for the internal or external market. There is a realisation among the participant that this is a challenging task since the new division is primarily built on employees that used to work for the other divisions and that most of the current products and/or services used to be from the other divisions. Furthermore, the new division lacks enough employees to operate fast and focus on developing new products and services. When the division is able to do

this, there is an expectation that the division will earn and gain its spot within the organisational structure. Furthermore, clarity will be reached about responsibilities of different projects.

The participant made also a distinction between hierarchical and matrix structures that can be found within the case-organisation. This combination sometimes creates difficult situations. Participant 1 explains that on the one hand an employee has to answer to a boss, who again has to answer to his boss till the highest level of management is reached. This is how financial request, promotion and salary are decided on. On the other hand, employees have to work together in teams with people that have different interest which do not align to the interest of your boss. Though, according to participant 16 teams are considered to be the future for the case-organisation. Participant 13 described that he believes that to realise a project, you need to find the stakeholders who are willing to put their resources into the team. On the contrary, this is completely different from the set-up known by the case-organisation. The status quo in the case-organisation is that an individual will get the task to form a team. This team is created by asking this individual what he needs and let him and these resources are when possible provided. This means that only the perspective of the this employee is taken into account when forming the team.

A long the same line, participant 11 found that the presence of the hierarchical structure has resulted in a situation in which higher ranked employees within the case-organisation do not really listen to employees in lower ranks. Higher ranked employees mostly rely on the advice of colleagues within the same or a higher rank within the organisation. This creates a situation in which not all the available knowledge, experiences and remarks are taken into account. Additionally, within the case-organisation different silos can be observed which makes it challenging to integrate the different functional areas for product development. The matrix structure is observed by participant 1 to resemble working projects. These different structures put forward some challenges. When there is an idea for a project in which multiple divisions should be included it is difficult to know who to approach within the divisions to initiate such a project. Furthermore, having to work within a hierarchical structure, but also having to work in projects means there are often contradicting interests that an employee has to face. According to participant 4, it means that cross-functional teams within the case-organisation are not a reality. Though, there has been effort to facilitate such an environment with the creation of open workspaces. These workspaces are according to participant 16 a distraction and noisy which makes concentrating sometimes hard. On the other hand, it facilitates communication. It is very easy to start a discussion and to gain more information and knowledge.

Organisation Culture

Comments made by the respondents about the culture within the case organisation are descriptive, positive and provide improvements for further developments. The case-organisation can be described as a traditional, family-owned and reliant on family-owned capital. Participant 8 has observed that within this case-organisation a lot of small island can be observed. These small island are all focused on initiating change. One of the biggest changes that has been observed within the case-organisations culture is the introduction of Design Thinking. This is a

method that guides team collaboration and can be adopted by teams. It is a small change. Participants have indicated that the culture should be evolving more. Participant 11 points out that this might be difficult for the case-organisation, because it is based on a very conservative way of thinking. At the end of the day it is all about the financial risks which means that there is not much freedom or the possibility of taking in the case-organisation. Participant 7 however thinks that it is important that the case-organisation will focus on developing a culture in which teams have the opportunity to learn on how teams can operate to their fullest potential. Among the same line, participant 8 indicates that the mindset within the organisation should be focused on being target-oriented and not structure-oriented.

Participant 7 made a positive observation that the employees within the case-organisation have been able to develop an organisational behaviour that guides employees in acting on common sense. This common sense is based on guidelines and organisational values. Still, there are still a lot of things unclear within the case-organisation. Project work for instance has no clear definition within the case-organisation. Participants have described teams to exist of two employees till six hundred employees. Participant 8 indicates that a team is working on a project and has C-level commitment. Furthermore, there are different expectations of what the new division is expected to do. For instance, one problem is that most of the employees within the case-organisation expect the new division to be an internal supplier which has been developed to give a boost in past and new ideas. This new division is able to work on these ideas according to employees, because they believe that the new division has new resources and more employees to allocated to these ideas. Although these expectations have not been met. Participant 17 made an important remark in that he observed that more and more international employees are based in the German offices which means that the case-organisation is getting more English-oriented.

Since the introduction of the new division the understanding of the product driven strategy has changed. Participant 17 indicates that the new division views the product driven strategy as based on ready made products. These products have proven to work for multiple customers. The longest existing divisions however view the product driven strategy as delivering tailor made and unique products to customers. These products are adapted to the situation in which they are used.

Leadership

Another topic that has been thoroughly discussed by the first round of interviews is leadership. Three forms of leadership can be distinguished within the case-organisation by the participants. One form of leadership is based on the expertise of individual team members. When this form of leadership is adopted the decisions that have to be made within a certain field of expertise are made by the team leader most knowledgeable about this field. This type of leadership is often guided by the goal of the project. Another form of leadership is the appointed team leader, because of his observed position in the case-organisation. A third form is that the decisions are made in a democratic way by involving the whole team. This could be described as the beginning of a self-organised team. This means that a team leader can be on the same level as the other team members. Though

according to participant 13 it must be clear who in the team is responsible for giving the tasks. The form of leadership that is adopted depends for a part on the form of leadership used within the case-organisation. Since, the case-organisation decision making structure is described to be hierarchical, it still should focus on creating an environment that is suitable for teams. This environment should provide teams with more power. At this moment, as participant 14 notes, teams still need the back-up of important stakeholders within the case-organisation to be able to run smoothly.

The first round of interviews also discussed the characteristics of successful and unsuccessful team leaders. According to participant 7 team leaders can influence teams, because of the behaviour and competences they possess. That means that successful leaders have had the right educational/practical background. These hard skills are necessary when dealing with third parties, because you need facts and figures to convince these parties that your proposal is the most outstanding one. Moreover, successful team leaders have experience, know when to escalate problems/situations and they are the right hand of the CEO's so they are empowered to have enough money and resources for the team. Furthermore, they have expertise, are flexible, able to motivate, are able to plan and pull project forwards, convince, precise, able to align interests of the different involved parties, possess lobby talents and are able to use argumentation. Additionally, they are able to step up in a team and solve problems, communicate effectively, be emphatic, open to new ideas and needs of team members, able to listen to others, loyal and can stabilise the team. A successful leader knowns how to create an environment in which the other team members can do their job without being bothered by administrative work, politics or other activities not related to the work a team members needs to do. To conclude, successful team leaders are always focused on presenting the teams interest and not the organisational leaders interests. This is often achieved by using a personal approach to the team collaboration and by always backing the outcomes of the team. An important note made by participant 17 is that for an organisation to operate successfully not every employees should want to become a leader.

On the other hand, unsuccessful team leaders often hide behind their team members which means that the team members have to catch the arrows that are shot at them. Furthermore, they are described as being very dynamic and lacking of experience in the products or markets. Additionally, they have often lost respect of the other team members due to for instance dishonesty. Sometimes, they are observed not to want to lead which means they create a native climate which is characterised by frustration. When such a climate is created, it means that team members often have a feeling that they are not able to share their opinion openly and feel that there is no trust. When teams are confronted with an unsuccessful team leader the main source of communication is written. Though, regularly in these teams there is no knowledge about timelines and there are no penalties for team members that do not operate as expected. Additionally, team leaders are perceived as being unsuccessful when they are social climbers. These team leaders are only focused on jumping from one position to the other and they neglect the experience that has already been gained. According to participant 11 they provide their opinion without really knowing the market or product. These team leaders are often new and lack years of experiences of the product or the market.

As earlier mentioned, it is important to know who is the leader within a team. Often teams exists of team members working for different divisions. When different divisions are included in a team than different line manager have responsibilities over the team. According to participant 14 this means that the team constantly has to deal with different priorities and changing objectives. Having one leader could according to participant 12 align outcome expectation since this employee can translate the team expectations to the management and the management expectations to the team. Participant 1 of the second round of interviews has however observed that there is a difference in cooperation between different management layers "the top and bottom are more cooperative than the middle layers".

Organisational Resources

The case-organisations is described by the participants as an organisation that has a lack in time, money and other resources. In other words, the case-organisation has a lot of good ideas, but the resources needed to follow-up on these ideas are not available within the organisation. The participants of the first round of interviews indicated that the resources are important, because if teams have the feeling that they are not supported with enough resources, it is highly unlikely they become successful. This feeling arises in a situation in which department goals do not relate or align to the project goals they are working on. This limitation of resources negatively effects timely communication and allocations of resources, because employees become more concerned with protecting or gaining as many resources as possible when there are limited resource available. Furthermore, when the teams do not possess the right resources than methods implemented by the team as SCRUM or Agile might not work, because these methods preconditions are not met.

Though, on the other hand, in the first round of interviews it was mentioned that the case-organisation was able to provide teams with capable team members, because the size of the organisation enables good hiring processes. Though, at the same time other participants cast a doubt about the exploitation of these capabilities. They were not sure if it was done in the most efficient way since a lack of competence in certain areas is observed by the participants. The participants indicated that one reason for this lack of competences can be explained by the development of the new division in the case-organisation. This new division exists for a larger part of employees of the case-organisation that used to work for one of the other three divisions. This means that these three early existing divisions have lost products, expertise and experiences to the new division. These gaps have not yet been filled, because finding new employees in these areas is difficult. Participant 1 of the second round of interview indicated the following "Yes, we are missing skills in methodology, but also in real like specific programming skills. If we just look at how many open positions we have, it is pretty obvious that we know that we are lacking a lot of people and a lot of skills".

Another feeling that arose because of this change is that some employees are not willing to lose a project they have been working on for a longer period of time. This makes it difficult to transfer projects to other divisions or departments that are more suitable to make the project a success. Another struggle is the fact that the case-

organisation is mostly operating in technical and software industries. In these industries most employees are male since a technical background is very important. This provides the teams within the case-organisation with less gender diversity. The importance of diversity and gender diversity is discussed under the heading 'team member diversity'. Though, participant 10 does indicate that it is part of the game to have the feeling that there are too many projects and that there are not enough resources to cover the projects. If this feeling would not be there for this participant it would mean that the resources are not used efficiently.

Technology

Participant 10 indicated in his interview that 'Industry 4.0' has had a big influence on project work, because digital technologies need to be incorporated within the project teams. Though, currently not every building of the organisation has project places with the right equipment. Participant 8 did an improvement offer on how technology could be improved to support individual employees and teams. According to this respondent, the case-organisation should provide a digital and central project overview platform. For instance, on this platform information should be placed about for instance who is available for team collaborations and what are there capabilities. Especially in the second round of interviews a view comments regarding the lack of technology were made. Participant 5 pointed out that he thinks that statements about a lack in available technology should not be overestimated; "I do not think that this is small part of the puzzle are really important here. Maybe they are just used to hide the real problems". Though, within the same round of interview, it has been indicated that WIFI is not everywhere available and there is a lack of cables in most meeting rooms. Since participant 6 of the second round of interviews indicate that interconnectivity is important these kinds of lacks should be addressed.

4.1.2. Team Composition

The interview guide addressed the multiple facets of team compositions. This sub-heading will discuss the results of the data found on team member diversity, team size, team tenure and interdependence.

Team Member Diversity

All the participants agreed that having a heterogeneous team provides a lot of benefits for the team. Teams should be heterogenous in age, capabilities, ethnicities and gender. This will provide teams with different experiences. Mostly, this is regarded as being positive. Though, a note should be made based on the data of the first round of interviews collaboration might become difficult when different divisions with different interests, backgrounds and business models are put into one team. Participant 4 of the second round of interviews puts it as "teams especially belonging to different divisions they have different goals, and they have their own agendas. Which is not perfectly aligned because they have different focus".

Having a mixture of different types of team members can support a team. First of all, when a team has multiple types of genders within the team than both the wider approach of approaching team work often adopted by women and the focused approach often used by man are represented within the team. Important to notice however is that team member capabilities, qualifications and experiences are more important than gender

diversity within a team. Thus, a team should not be focused on being diverse in gender, but should be focused on gaining the right capabilities within the team. Furthermore, having team members that have different educational backgrounds does not provide the team with deep expertise, but might be helpful and should be considered based on the goal of the team. Different age groups should be represented in a team. Young employees often bring energy, flexibility, new perspectives, technologies and ideas into teams. Furthermore, they are willing to try out new things. More experienced employees provide experience, a bit of grouch and often know quickly how to find a solution for a problem though they can be inflexible. In other words, younger employees often work by trying out something new and after the try out assess if it worked. In general this is a fast way of working. More experienced employees on the other hand think before they start to work. This way of working is characterised by being less risky, more serious and secure.

The above described experiences are important for teams, but it is also important for teams to have team members with different characters. The team should have employees with different comfort zones, because this means they know their weaknesses and strengths, feel motivated and happy. Different comfort zones will provide the team with more saturated outcomes. It also becomes more important to include team members with different ethnical backgrounds since the case-organisation is a multinational and thus producing products and services for different countries. Furthermore, participant 14 pointed out that teams should be a mixture of team members that are demanding and pulling other team members forward and team members that are more silent and introvert. Additionally, teams should have a few team embers that are focused on working with data and others on communication and so on. On the other hand, the team should provide the team members with the opportunity to be able to share, learn and use the different experiences to reach the goals. Without this diversity, chances are higher that teams might become more blindsided and are only able to think inside the box.

There are also a few employees that should be avoided within teams. These are individuals more focused on profiling themselves without honouring the contributions of others. A side note should be made that the more flexible employees are the easier it is for the team to cooperate when diversity is increased. Thus, it does, also, mean that homogeneity in a team does not directly mean that a team will fail.

Team Size

Team size turned out to be a variable that is often thought of differently by different participants. When discussing team size, different team sizes have been mentioned, ranging from very small (2 employees) to very large (600 employees). Though most participants indicated that the team that they operate in are between the 20/30 team members. Participant 1 indicated during his interview that a successful team has a size that represents the size of the project the team was working on. Though, most other participants when asked about the size of the teams they have operated in, answered with the amount of employees or the amount of divisions present in the team.

There were participants when they discussed teams that made a distinction between core teams and employees supporting the team in the background. This resulted in a situation in which the core team could be quite small, but since the participants of the interviews viewed the supporting employees as part of the total team, the team could become larger. Participant 6 indicated that in his experiences the larger the team the least likely it is that the team will have success. Participant 2 indicated that a successful team according to the SCRUM method is between the 8 and 10 employees. During the first interview round it was noted that teams that are considered to be small often are regarded as less important. Therefore, these teams do not always receive the attention that they need. The reason these smaller teams are positioned lower is because they regularly do not acquire the largest incomes compared to other teams. It has been indicated that not prioritising these smaller teams negatively influences the process of the teamwork of these smaller teams.

Team Tenure

Team member turnover is a phenomenon that might occur, but it is often not anticipated because most employees at the case-organisation have been working most of their working life for the case-organisation and are not expected to quite. Most of the teams within the case-organisations have thus experienced a change in team membership, because of retirement or resignation. This means that most teams are faced with a situation in which team members can rely on each other and work together efficient, because they do not loose knowledge and competences of the different team members since they do not leave. For teams to be successful it is important to have team members that can replace other team members when they are not able to participate in the team for a short period of time. Participant 9 explains that this means there should be clear definitions of everything regarding the project, task, objective and activities. When this is clear it will be easier for the new team members to take over certain responsibilities.

Critical in the change of team members is the handover, because the new team members need to learn the mindset of the team. Additionally it will take time for the team to get back to a productive modus, because new team members bring new ideas and perspectives. This needs to be guided in the right way. A change in team membership could decrease motivation and slow the learning curve of the team. To make this process less disruptive an open culture and a willingness to accept new team members should be employed in teams. This could be achieved by having clear definitions of the project, task, objectives and activities. Another problem within the case-organisation is the fact that there are too many projects and it is difficult to find new team members, including replacing team members. Even though, this process can be improved by communicating clearly and including all involved parties. However, team member change does not have to be negative. Participant 13 describes a situation in which an team cannot move forward in realising an idea then a change in team membership can refresh the team and make them able to move forward again.

Interdependence

Teams that are successful often have a large team spirit. This means that objectives and goals align, knowledge is exchanged and everyone knows of each other where they are working on. Thus, the team is thinking about the

interests of the whole team and not only of individual goals. This means that the team is characterised by clear communication and leadership and the team is assessed based on the performance of the team and not on individual performances. This might be difficult within the current case-organisation since participant 11 has observed that the different departments compete against each other and headquarters results in decision do not align the general strategy. This makes feedback and rewards that motivate important. Feedback is a very good mirror of the behaviour and output of team members. Though, participant 1 has indicated that teams do not always make use of the feedback they get. This could be improved since feedback is important, because it provides the recipient with a feeling that the leader is happy with the contribution to the team. Feedback does need to be given at the right moment. This moment is as quickly as possible after the event the feedback is based on. Furthermore, the feedback should be given in person.

Participants of the first round of interviews have given different evaluation of the use of rewards. Often when the participants thought of rewards, the participant thought of monetary rewards and then an improvement in secondary conditions. Rewards are especially in higher management important and used. This results within the case-organisation in a higher management focus on larger projects when compared to smaller projects since the larger projects are more likely to gain employees rewards. According to participant 14 rewards should exist of honour and recognition. Though, according to multiple respondents the best rewards that are often given within teams are recognition for the effort by motivating each other and celebrating small successes. These kinds of rewards can change thoughts about working just being work weeks hours that need to be worked to thoughts about helping team members and overcoming pressures and challenges.

Participant 11 and 16 have indicated that teams are also depending on the structure of the case-organisation in their success. Participant 11 has observed a situation within the case-organisation in which department compete against each other and struggle with headquarters which results in made decisions that do not align with the general strategy of the case-organisation. Therefore, according to this participant it is important that the new division is going to focus on ow they fit within the constellation of the organisation to make sure that annoyances of the other divisions will settle. Participant 16 indicates that there is a lot of friction load within the organisational structure since there is a feeling that the new division is doing the same job as the existing divisions used to do and thus expectation are not reached. This creates the above described situation of participant 11. Participant 8 has indicated that for him stakeholder management is the key to all the different parts oft the team work. Without this stakeholder management and thus not knowing what stakeholders expect from you give you the chance to fail of nearly 200%. Therefore, adopting this stakeholder management more often teams should be able to become more successful.

4.1.3. Individual Characteristics

An important part of team collaborations are the individual team members. Participants of the interviews have made comments about certain employees they appreciate in teams and which team members they rather not have in their team. Employees who might make it more difficult for teams to become successful are employees

that cannot look beyond their own opinions and thoughts and who cannot conversate easily. Appreciated team members are also employees that do not withhold information, are open, operate according to the made appointments, do not justify themselves to third parties which are not involved in the project and do not start discussions over and over again. When these behaviours are observed by a team, they are classified as delaying techniques. Though, teams need to keep in mind that how team members can behave can change during their time in a team.

Positive behaviours within teams are the competence of self-alignment, intrinsic motivation, proactiveness, hard-working and goal-oriented attitudes, flexible communication abilities, open-mindedness, reliability, respectfulness and the ability to arrange the situation so that everything runs smoothly. Being proactive is important, because team work is work that is done next to the daily activities of the employees of the case-organisation and often team members have not chosen to participate in a team, but are told to participate in team. When a pro-active employee possesses pro-active behaviours it will be able to make its involvement in the team collaboration successful. Self-working teams would be an utopia for teams in the case-organisation, because they do not have to put pressure on the team members. To be able to use these kind of teams, team members need to know their weak and strong points. When the involved team members all have different capabilities, characters, networks, inspirations and experiences than they might be able to learn from each other during the collaboration. Having team members with a different network is important, because they can be used for internal networking when a team needs something that is outside of the teams reach. Though, all the above described behaviours and characteristics are important while they influence how team members will interact.

Participants have indicated that project agendas of different departments are penetrating the team collaboration. This is influencing the thinking and acting of the team members. Furthermore, it is complicating the communication, because information is often late or needs to be actively pursued. How often and in which way team members communicate is very important. Close proximity between the team members is often a situation in which good communication can be established since according to participant 14 you can hop from office to office with questions, feedback and discussion and often get an immediate response. The team members should perceive communication to have short lines, clear statements and rich enough to be used as a basis for decision making. According to participants 7, 8, 12, 13 and 14 communication should be direct and happen when all team members are together within a room. Participant 8 indicates that initial meetings need to be face-to-face, follow-up meetings can be mediated. When a first meeting is done face-to-face it provides the team members with knowledge about how the other person looks, his mimics and how the team member acts. Participants did point out that mediated communication should be used to support the team. It was also mentioned that different generations might prefer different forms of communication since younger employees often have been growing up with mediated communication and might feel more at ease using this form of communication. Unsuccessful communication is described by participant 11 to be characterised by mistakes, jealousy, hidden and unopen information and back stabbing. Or unsuccessful communication can be established by behaviours of employees described by Participant 7 of the second round of interviews. He mentioned the

following “We have here the problem that division 1 is not willing or the people here are not willing to give something to digital solutions”. This participant observed that ex-colleagues are no longer able to look at him or talk with him; “this is the mood in division 1 against the new division. They think the new division is not their friend, it is their enemy”. Participant 13 indicates that two theories on behaviour can be observed in organisations, namely Not Invented Here and Proudly Found Elsewhere. The first theory indicates that a solution or idea of another individual is better, but since it has not been your own solution you are not going to use it. The other theory is exactly the opposite and strives for finding the right solution or idea no matter the source.

For a team to operate successfully, it is wise that individual team members are able to work on their own and try things out before discussing. This supports the learning process of the individual and it facilitates successful communication, because the need to clarify everything becomes less. It is also important that the individual team members keep on smiling, because this creates a positive ambiance and this will work constructive. Additionally, it will support the team to get through tougher moments. Moreover, unhappy employees will provide the team with a feeling that they are not making the most of the team collaboration.

4.2. Processes

Processes were found to exist of three different groups in the theoretical framework, namely the transition phase, action phase and interpersonal phase. Table 6 highlight the most important findings regarding team processes. These points are highlighted in the sub-headings below table 6.

Table 6

Important findings of process variables of team effectiveness in an ‘Industry 4.0’ environment.

Process Variable	Findings
Transition Phase	• There needs to be a common understanding of what every team member is supposed to do • There should be a small amount of goals or one goal per team • Expectations need to be aligned between the different stakeholders
Action Phase	• Team should focus on consistency so they do not lose experience
Interpersonal Phase	• Competition can support teams when it provides them with a challenge • To keep employees motivated you need to respect them, have friendly conversations and try to avoid negative conflicts

4.2.1. Transition Phase

For teams to operate well, it is necessary that everyone understands what they need to do. Participant 4 of the second round of interviews gives an example regarding the provision of understanding; “The boss said to the secretary can I have please a cup of coffee and she was not clear he wanted it to have it maybe with sugar or with milk or black. It was not clear formulation of expectations you know”. For participant 10 this means that the

overall goal of the team and the activities that need to be done by the team are defined. For successful teams, it is important that there is one goal or a small amount of goals, because it provides the team with clarity. Furthermore, expectations between team members and the organisation need to be aligned. This might be challenging, because the divisions and team members often have conflicting goals. To clarify, within the case-organisation every division has its own goals and they are often not directly caring about how well the other division is doing. Furthermore, it is important that the team goals reflect the departmental goals of the team members otherwise according to participant 9, it will be difficult for team members to be motivated to keep participating in the team. A reason for this decrease in motivation is given by participant 11. According to the experiences from this participant departmental goals and personal goals are often considered before team or common goals. Therefore, as experienced by participant 12 having a team with different team member targets is a sign of a struggling team. Thus, with no clear goals misalignment between the different goals involved in the team collaboration will occur.

However, the above does not mean that unclear goals should be avoided. According to participant 7 unclear goals or unclarity about reaching the goal can only be used in teams that are expected to use creativity to find solutions. Though, at a certain point in the operation time of the team it should be clear what the goal is, when the goal needs to be reached and who the involved stakeholders of the goals are. Thus, factors that slow down team outcomes are no clear alignment on goals and no commitment to put resources into the team collaboration.

Participant 10 indicates that a successful team exists of participants that work in the same direction with transparent objectives and clearly defined tasks. This means there should be task clarity and role clarity. Task clarity is defined by the participants as a task that is related to the objective of team. Thus, the objective should be clearly defined to be able to be completed. Role clarity according to participant 8 should be defined in the planning phase of the team collaboration, but when the team is operating these roles can and might change when the goal is clear to the team. According to participant 8 most projects have three phases. Within the second phase most teams feel comfortable to implement changes. Though, according to participant 14, if these changes are related to the goal of the team, it might result in stunned team members, because part of the work they have done will be lost. To have the highest level of success, the tasks performed by the team members should be in their range of talents. Though, participant 12 indicates that within the case-organisation it is often difficult to work in teams because within this environment defining responsibilities of different team members remains to be challenging.

Good communication is vital to create clarity for the team members. Good communication facilitates discussion about the status of the task, activities and goals of the team. This communication should make sure that the projects that are being initiated are a good combination between projects focused on the market of today, tomorrow and the day-after-tomorrow. Furthermore, this communication will support team members in knowing what is expected of them inside of the team. When these preconditions are met team members will be

able to work in the same direction. These communication processes but also the decision-making processes should be based on how the revenue of mark-ups will be distributed among the various divisions involved in the team collaboration. According to participant 17 it is not clear how the revenue of mark-ups are currently distributed. There are employees within the case-organisation that are afraid that, because of the development of the new division customers have to pay for additional mark-ups, mark-ups provide by one of the three existing divisions and for the mark-ups of the new division. It is indicated by participant 17 that employees are afraid that this will harm the competitive advantage of the divisions and thus case-organisation. This created a situation described by participant 1 of employees building their own kingdoms to claim as much work as possible.

4.2.2. Action Phase

Important for teams to function successfully is not to change too much surrounding the team when documentation is not available, because it will slow the team down. Therefore, according to participant 15 there should be an increased focus on consistency in teams which will result in not losing the experience necessary for teams to be successful. Documentation as clear timelines and fixed budgets, can be important to the team, because they facilitate clarity about tasks and responsibilities. Additionally, it is important that feedback is given. Feedback can reveal relevant insights in the project from different angles. Especially feedback from employees who have an understanding of the pitfalls of the team is valuable. Participant 17 perceives feedback to be the lessons learned after an executed project. Feedback contributes to the individual team members understanding of how helpful their contributions have been to the team. Team members should not only be reliant of receiving feedback, they should actively pursue getting feedback. Therefore, according to participant 8 feedback should be ongoing.

Good feedback is described as being prepared, structured, existing of clear objectives, scopes and information about how individual team members are performing and contributing to the team. This feedback should be constructive. According to participant 14 close proximity will support to give and receive feedback within a team. Furthermore, when team members are able to participate in self-reflection feedback becomes more valuable, because team members have been able to do something with the feedback. Additionally, it is important that team members and team receive the time to interact on the feedback that they have gotten. This will limit the chance of feedback being perceived as humiliating and thus keeps the team operating on good working terms.

4.2.3. Interpersonal Phase

Where individuals work together disagreements and conflicts can arise often as a result of competition. Though, competition within teams does not have to be bad, because it can facilitate speed, discussion, change and growth. Having a small crisis according to participant 7 can even trigger our natural behaviour of wanting to change something and provide the team with the opportunity to grow together. It is giving team the opportunity to improve or worsen the situation in which the team landed. Another form of competition that is proposed by participant 13 is competition based on challenging each other. This form of competition is often accepted by all parties involved. Competition becomes negative when the competition is described as being a blockage.

Participant 7 made the following division between positive and negative struggles. Struggles based on the company, team, or product will almost never have a negative influence on team collaboration. Though struggles regarding individual goals will have a negative influence on the team collaboration. Negative conflicts and/or disagreements can be limited by having different genders in a team, because often this has a positive change on the communication within a team. The conversation will become less aggressive.

Participant 17 has observed that struggles within the case-organisation are negatively influencing the strong position of the case-organisation in their markets. The emotional level of the different stakeholder should never be underestimated according to participant 14 in team collaborations. It is thus important that dwelling conflicts are detected and avoided, because this will improve the contribution of the individual team members to the team and will improve the overall mood within the team. This is important, because when team members do not enjoy working in a team they will leave and leave behind a gap of knowledge and experience. According to participant 14, to keep employees motivated you need to respect them, have friendly conversations and try to avoid negative conflicts. It was indicated that the case-organisation hires external mediators to solve these conflicts, when really large conflicts arise.

4.3. Mediators

Within the data of the interview round multiple mediators could be observed. In table 7 the most important findings regarding the 'Industry 4.0' environment are summarised.

Table 7

Important findings of mediator variables of team effectiveness in an 'Industry 4.0' environment.

Mediator Variable	Findings
Team Confidence	• There is a trend observable that employees have less time to focus and no intrinsic motivation to work in teams
Adaptation	• Since the case-organisation does not have enough human resources they need team members to back each other up
Trust	• Strong connections are needed since the teams often needs specific technological knowledge to operate
Cohesion	• A lot of team members are not able to put their full focus in a team, since the have many side activities which take up a lot of time.
Team Empowerment	• Employees are put into a team by supervisors without thoroughly considering if it makes sense or if the result will benefit the organisation. • The organisation has an obstructive power on teams

The interviews in the first round of interviews showed that the effort individual team members put in their teams differ. Efforts of team members increase when they can work on exciting, challenging and loved topics. This

situation occurs when team members back an idea and are motivated to reach the goal even when they are perceived to be challenging. Though, there are also teams in which team members cannot be fully focused on their task as a team member, because they have to participate in multiple teams or they have a set day-to-day activities that need to be finished within deadlines. Participant 12 indicates that there are at the moment too many projects though it depends from team member to team member what too many teams and side-activities are. This means a great amount of organisational effort is necessary to coordinate the multiple teams of team members. Though, currently employees within the case-organisation are put in teams by supervisors without thoroughly considering if it makes sense that this employee participates within the team or if the outcome will benefit the case-organisation. This results in teams which are not able to set work meetings, because the team members experience conflicting work obligations. There is a trend observable in the case-organisation in which employees have less time to focus and no intrinsic motivation to work in teams. This influences the emotions of the team members and the ambiance of the team.

Additionally, in the first round of interviews, the participants indicated that the overall case-organisation has an obstructive power on teams. Teams are surrounded by different interests which makes them struggle even when the team members know each other or have a history of working together. Participant 12 indicates that successful teams have no members that work against the target set by the team. Furthermore, the organisation and departments often have a large influence on the composition of the teams. This is not always favourable. Though, because departments often do stay involved in the team collaboration, the team members can call on their networks if they need resources, knowledge or information that is not available to the team. To make the influence of the organisation as less obstructive as possible, it is important that there is clarity on what everyone is expecting from each other. Since, expectations can shift, it is very important that every time when the team and the organisation meet in milestone meetings, steering committees or emerging session that the expectations are discussed. Teams need to gain a certain self-understanding of what they are doing and why they are doing the work. They should see and understand the big picture. Thus, teams should strive for a situation in which they have the ability to have their own vision and power to create an environment that enables them to arrange resources for the team. This should happen in an efficient way which means that no one is doing the same work. This feeling of ownership will provide the team with motivation.

To conclude, the ambiance within the case-organisation can be described as tough. On the one hand something beautiful is created, on the other hand there are individuals and events that holds back teams. This ambiance makes it difficult to produce successful teams since these are characterised by being flexible, focused, progressive, motivated and experienced. For the teams to thrive, according to participant 10, it is important to create a speak-up culture. Additionally, team members need to support each other and back other team members when they feel they need help. Furthermore, the team should have access to team members with relevant skills. Since, there is no overview regarding employees that are available to operate in teams outside of their day-to-day responsibilities, there is a feeling that the right expertise for the goal of the team is not often available. Or they are already deployed in other teams, referring back to the point that not much thought is put

into the decision which employees is going to join which team or the case-organisation does not possess the employees with the skill. However, the case-organisation can be helpful in supporting these teams that might not be optimally structured by keeping their commitments, making sure that appointed team members have the right capabilities and show that every team is a priority to the organisation. They should try to limit the high pressure put on teams as well as the high expectations of the stakeholders.

Furthermore, in an ideal situation the team members already know and trust each other. Trust will provide the teams with speed, because the need for documentation becomes smaller, direct communication, commitment and efficiency. Direct communication is important since the direct reporting line is responsible for allocating employees in teams and a general overview is not available. Furthermore, according to participant 10 teams are often based on projects characterised by specific technological knowledge. Strong connection are needed to be able to transfer this kind of information, because otherwise the information will not be understandable for many employees. However, creating this situation in which there is trust and thus speed, direct communication and efficiency might be difficult since the case-organisation has 500 open hiring positions. This means that the case-organisation is missing a lot of specialisation. Participant 17 indicates that gaining this specialisation or knowledge within the case-organisation will be difficult since the case-organisation is looking for employees in a competitive market were not enough individuals graduate to fill the demand. Therefore, for current teams it is very important that team members support each other and have fun.

4.4. Outcomes

Some important remarks were made regarding the outcomes of teams. These remarks are discussed in more detail underneath the table.

Table 8

Important findings of outcome variables of team effectiveness in an 'Industry 4.0' environment.

Outcome Variable	Findings
Performance	• Even though, the new division is not working on products that are interesting from an economic point of view, it is believed that this part of the organisation is important for the success of the other divisions. • Teams should always focus on taking care of their customers

Successful teams have projects that were on time and on budget. An important remark made is that the case organisation is focusing on projects that have an immediate return on money and that the case-organisation is overlooking projects that are improving the competitiveness of the organisation. Furthermore, teams should become more focused on developing technologies that are disruptive. This focuses is needed, because now-a-days organisation need to be more effective, fast and deliver better quality than low-wage countries to be able to compete. They also need to be able to do this for a premium price. This affects the newly developed division of the case-organisation since current products produced by the case-organisation are not interesting from an

economic point of view. Though, this new division is thought of to be important for the further success of the existing divisions. This situation produces classing targets. Participant 17 has had an experience with a customer who has indicated to wanting to receive less data and who had the desire to limit production on data information since this customer has had negative experiences. Another outcome that teams should always focus on is that they take care of their customer.

Participant 8 indicates that team leaders are responsible for the outcome of the team. So when something is happening what is perceived not to be right the team leader should interfere. These team leaders are also responsible for how the teams behaves themselves. They set the standard for how the team members are expected to behave themselves.

4.5. 'Industry 4.0' and Methods

This section will discuss the data that was found on 'Industry 4.0', autonomous teams and already applied work methods within the case-organisation. Participants of the first round of interviews were independently from the team effectiveness measure, asked for their own definition of 'Industry 4.0' and their opinion of autonomous teams as a team structure that could solve problems.

4.5.1. 'Industry 4.0'

The participants agreed with each other that the introduction of 'Industry 4.0' has meant major changes for the case-organisation. The clearest observable change has been the development of the new division within the organisational structure. However, based on the different definitions given by the participants it can be observed that it is not yet clear what 'Industry 4.0' entails for the case-organisation. Taking all the different definitions given by the different participants and combining them provided the following definition of 'Industry 4.0':'

"'Industry 4.0' is the opportunity for organisations to start making intelligent solutions part of their DNA by connecting all kinds of knowledges. These intelligent solutions are characterised by digitalisation. It is all about creating efficiency, flexibility and connectivity. This is done by building sensors, gathering information, analysing information and developing dashboards. Production machines will be made more intelligent, which makes them able to converse with each other, create product understanding and enable them to make their own decisions. It is characterised by the fully automated chop floor, the automation of manufacturing equipment and the interlinking of the complete lifecycle of a product. Furthermore, the organisational context will become a more complex situation driven organisational behaviour where hierarchies are smaller and work becomes more project-based. This will enable organisations to take more advantage of the interconnection between machines and people which will provide organisations with more self-organised entities. These entities will be cross-functional since every new solution is based on multiple expertise's. This will provide organisations with the opportunity to give their customers a higher product/service reliability.".

Participant 4 made an interesting point about how 'Industry 4.0' can be interpreted. According to this participant there is a German way and American way of viewing 'Industry 4.0'. The difference is that the German view is based on making manufacturing processes more planned, more efficient and automatic. This view is based on the technological point of view. The American view can be described as the 'Industrial Internet of Things' (IIoT). This view is characterised by someone who can connect machines in order to provide new services to customers and is dominated by the customer value creation point of view.

Currently, not all the participants are convinced that 'Industry 4.0' is a revolution. Some indicated that they see it as an evolution. For them it makes sense that automation is evolving to connectivity. For participant 14, 'Industry 4.0' is the result of developments that have been ongoing for the last 150 years. Though, the participants indicate that the case-organisation is interested in 'Industry 4.0' and in performing according to the 'Industry 4.0' guidelines. Participants 4, 5 and 12 indicate that the case-organisation, however, is more involved in the Internet of Things principles than the 'Industry 4.0' environment. According to these participants the case-organisation is involved in activities which are mostly focused on software/hardware solutions, but not on production and therefore no 'Industry 4.0' activities. So, to conclude, the case-organisation is primarily focused on automation which is pre-programming tasks in machines that are able to deal with a multitude of big problems. These products are developed by the case-organisation to make other organisations 'Industry 4.0'-ready.

4.5.2. Autonomous Teams

Often when autonomous teams were discussed, it was seen by the respondents to be as a possible methodology that could be used within future team collaborations in the case-organisation. Possible positive changes are that conflicts from the hierarchical structure will disappear and there can be an improved support for customer projects since these kinds of teams offer room to work on customer pain points. Though, according to participant 8, teams should keep in mind that tending to customer pain points does not mean that an organisation should go bankrupt. Furthermore, the introduction of these kind of teams could improve creativity in teams and align team members and different topics. Another possible positive change described in the interviews was that these teams can be that there is an improved understanding of how organisations or teams operate when making teams responsible for their own financial situations and their behaviours and outputs. Important, is that the set-up of the teams is well-organised, because only then a situation will arise in which limited guidelines and directions are needed. Participant 6 of the second round of interviews explained it like this; "The more autonomous you get, the more you need to have feedback and like reflection and discussion and communication with the team, because otherwise you are like the free bird who is just like nowhere else and you do not know where you are and a lot of other people do not know where you are". Furthermore, using autonomous teams can open close environments and provide more freedom in decision making. Participant 1 of the second round of interviews indicated that he is asked for more guidance; "What I see that most people, actually, are not able to deal with the degree of freedom that you give in their rather autonomous ways. So, you probably need to

learn it. It will not work for one day to the other that you see 'come on you just need to reach this goal, I do not care how you do it'. But at the moment the team asks me for more guidance actually".

Participant 15 indicated that it can be advisable to only implement autonomous teams in the case-organisation when teams are responsible for the development of products and services that are not yet a part of the organisational portfolio or are related to the portfolio of the case-organisation. Participant 13 includes that the goal of the team should also be clear, otherwise the success of the operation of the team cannot be guaranteed. Furthermore, it has been mentioned that these teams will never work, because there will always be restrictions. Additionally, these teams might increase the potential risk for organisations, because of the amount of freedom the team has. Participant 14 expects autonomous teams to be demanding, because they are based on team members that are able to organise themselves and who are able to ask critical questions to keep the team on track. This participants expects that there are employees who will not want to operate in such teams.

4.5.3. Adopted Methods by the Case-Organisation

Autonomous teams are discussed as a part of the possible future of teams for the case-organisation, methods as Design Thinking, SCRUM and Agile which have also been discussed during the interviews are currently adopted methods. According to participant 7 when a methodology is working well in a team, it has the ability to improve the team experience. During the first round of interviews, it was pointed out that these methods have been developed by the best professionals under the most beneficial preconditions. Therefore, it is important that team members have acquired knowledge of the methods used, because not a lot of time should be spend on understanding how to work according to a method when the team is operating. These adopted methods received multiple praises. Participant 12 indicated that the Agile method can support teams that work with unclear criteria, because it supports the adjustment process and reduces time to market. Positive about SCRUM is that it forces team members to communicate.

Participants provided in their interviews feedback on their experiences in teams in which they collaborated using a method. An interesting point was made that at least the workshops and innovation teams need to adopt a method when operating. This point suggest that not all teams have to operate on a method. Though, when, for instance, a SCRUM team is developed, it is advisable that team members work in the same building and have daily and weekly meetings in one location. These teams should not have a clear leadership or adopt a top-down approach. For these teams to be a success a SCRUM-master is needed together with motivated team members.

On the other hand, it was observed that within in the case-organisation that Agile is confused with being unstructured and teams might use the methods, they do not operate according to the guidelines of these same methods. This has resulted in a strange mixture of traditional project management and Agile project management. Participant 6 indicates that this shows that the case-organisation is afraid to change their way of working. According to participant 13, it is also not beneficial to have a mixture of approach with the organisation, because it will lead to confusion which will cause a loss of efficiency. There were also participants who indicated

that a teams success is not related to an adopted method as Agile, SCRUM or Design Thinking. Additionally, it was mentioned that not every method is applicable to every team. The fit of the method depends on the employees involved, the task and the context. A point was also made that autonomous teams, SCRUM and Agile are hyped phenomena in the business environment that only function when the team members are motivated and eager to achieve the goals.

5. Discussion

After the elaboration of the results, this chapter will outline what these results mean. The discussion will discuss the theoretical and practical implications of this research. Furthermore, limitations and future research areas are highlighted. The subsections are all focused on answering the research question of this research: *'How does an organisation that is adjusting to an 'Industry 4.0' environment establish team effectiveness?'*. To answer the research question, this chapter will highlight the most important findings in the result according to the constructs found in the IMOI model. Qingfeng, Wenbo, and Lihua (2008) have found five areas that are critical to the organisational transformation, namely corporate strategy and vision transformation, organisational structure transformation, product and market transformation, business process transformation and corporate culture transformation. Interesting findings have been found in these areas.

The two rounds of interviews have shown how the participants of the interview rounds and team members within the case-organisation have experienced teams that operate in the 'Industry 4.0' environment. The participants have discussed good experiences and less successful experiences. These have all been explained in the result section. Based on this result section the research question answer is based on the following four points found in the result section:

- For the largest part, the case-organisation is still characterised by hierarchical structures. Most organisations within the industry sector are hierarchically structured (Schlechtendahl et al., 2015). Since this structure is still clearly observed within the case-organisation it is difficult for teams to operate without external meddling. This means teams cannot operate autonomously and are constantly confronted with changing objectives.
- Another important reason why team effectiveness is not established is because there is no alignment between goals, expectations and focus of team members and other involved stakeholders. Mladineo et al. (2017) have indicated that there are differences between production and manufacturing networks. Production networks are characterised by vertical collaboration in the value-adding chain and manufacturing networks observe a horizontal collaborations within their networks (Mladineo et al., 2017). Teams that have been observed were horizontal collaborations. This means that in these teams different divisions and departments are included. As the theoretical framework already pointed out that the autonomous systems should be implemented in the new environment. This implementation has not been done within the case-organisation. Consequently, the meddling and the absence of a disruptive 'Industry 4.0' product gives the teams an uncertain atmosphere to operate in.
- The results also show that teams experience that there are not enough resources for every team. The interviews have indicated that there are not enough rooms within the organisation in which the teams operating on 'Industry 4.0' can work together. The focus of the longest existing divisions has always been on engineering and industry. Within the new environment the focus also lays on software. As a

consequence, technology addressing the software environment is missing in large parts of the case-organisation and meeting rooms often do not provide an inspiring atmosphere. Furthermore, resources as the most suitable employees for team collaborations, time and money often are not distributed in an efficient manner. As a result, participants of this research indicated that they feel not supported.

- Within the case-organisation there is no consensus on how 'Industry 4.0' is conducted. According to Wang et al. (2016) the idea behind 'Industry 4.0' is "to use emerging information technologies to implement IoT and services so that business process and engineering process are deeply integrated making production operate flexible, efficient, and green way with constant high quality and low cost" (p. 2). Though, the participant shave indicated that there are two ways of looking at 'Industry 4.0'; the American and the German. The American way is focused on IoT (Internet of Things). Though, as earlier explained IoT is a part of 'Industry 4.0'. Since, there is no consensus on this 'Industry 4.0' it can happen that there is unclearness of what to expect of the new division.

As indicated above the most important results found are connected to organisational structure and team processes. Most of the participants during the interviews discussed how the involvement of different stakeholders within the team made the team operate less effective. As the results indicate and Brettel et al. (2014) have found is the environment in which 'Industry 4.0' teams operates more complex. An important characteristic of 'Industry 4.0' is the horizontal integration of the organisation (Wang et al., 2016; Liao et al, 2017). The case-organisation has been described in the methodology chapter as diversified. The case-organisation exist of four different divisions currently. One of these divisions, the newly developed division and the division focused on the 'Industry 4.0' environment is dependent on operating in the internal markets and external markets. This means that since the introduction of this division, teams have started to come into existence that represented team members of multiple divisions. Teams have not yet been able to deal with the different expectations, goals and focuses that are brought into the team by the participation of the different divisions.

This meddling of different parties within teams is made easier within the case-organisation because of the hierarchical structures observed in the different divisions. This means that team members have to commitment to a team, but also have to report to their boss who is responsible for their evaluation, salary raises and promotions. In the results, it is indicated that within the case-organisation most team members will then focus on reaching individual or departmental goals. Agarwal and Brem (2015) indicated that leadership has an important role in communicating the new vision of the organisation the new strategy and the direction the organisation is going to take. When done correctly, it will maintain the corporate culture and enjoy the kept stakeholders trust (Agarwal & Brem, 2015). Though, as the results have shown the leadership is often causing problems within the teams because they meddle. Even though, most organisations are still characterised by this traditional structure, Götze and Jankowska (2017) have pointed out that within an 'Industry 4.0' environment there should be decentralised, informal and unstructured teams. These teams have been observed by participants in R&D teams within the case-organisation, though not yet in teams focused on 'Industry 4.0'.

Furthermore, it has been difficult for the case-organisation to express the new strategy they want to conduct surrounding the 'Industry 4.0' environment. Kolberg, Knobloch, and Zühlke (2016) have found in their research that most organisations are not able to arrange 'Industry 4.0' operations with a green field. This includes the new division within the case-organisation. They inherited a large amount of products and employees from the longer existing divisions. Moreover, there is also a lack in resources which created a situation in which the new divisions has not yet been able to produce an 'Industry 4.0' product that is disruptive or exceed expectations of the other divisions. Therefore, there are different assumptions within the case-organisation about what 'Industry 4.0' is and how it is conducted within the case-organisation. Special about the results is that the division within the case-organisation that is focused on 'Industry 4.0' is looking for producing products and services which are ready made and implementable by multiple customers. Though, the definition given by Basl (2017) in the theoretical framework has indicated that 'Industry 4.0' is focused on trying to reach a batch size that equals 1. This does not make it easier for other employees to understand what the new division is doing.

Accessibility, an important value in 'Industry 4.0' (Lu, 2017) has also not been met. For instance, the participants have expressed a feeling that there is always a lack of resources and they also found that not all the technological tools for successful team collaboration can be found within the case-organisation. This means that there larger teams who get more priority and team collaborations in meeting rooms often loose productivity, because of a lack of cable or available WIFI. This has resulted in situations in which small entities within the case-organisation are creating their own small kingdoms to claim as many things possible. This can be resources, but also product ideas.

5.1. Practical Implications

One of the biggest challenges faced within the case-organisation is unclarity and how to adopt this new 'Industry 4.0' environment within the organisation. Where above the most important points of the results are discussed, this sub-heading focuses on how these important findings can be resolved. Most of this unclearness is a result of non-consensus between different stakeholders involved in deciding what the output should be of the teams. Practical implications that are perceived to be the easiest to implement and have a positive influence will be first discussed. Thereafter, longer-term implications will be advised.

Since the case-organisation has a hierarchical structure, a first step to overcome this non-consensus would be to let the higher management stakeholders explain what their expectations are of the performance of the team. Hereafter, these stakeholder should meet in order to create alignment between their expectations. In the end, it is advisable to communicate the outputs of the session down the line. This evaluating process can also be adapted when new teams start operating. This should be a change that could be adopted within the case-organisation. Other changes that could be considered by organisations are the development of a digital platform in which all the employees who are expected to perform a certain amount of work hours in a team collaboration could be placed. In this way, the organisational effort could be diminished to create teams, since there is one

central place employees starting a team initiative can visit and find names of employees who are able to participate in their team based on expertise and availability. This should support employees in navigating the complex environment of 'Industry 4.0'. Additionally, organisations could give departments the freedom to create space in which they think their 'Industry 4.0' teams will be able to collaborate with each other. This implementation should provide an equal accessibility to technology and resources and thus less discrimination which should improve the ambiance.

Changes that are advisable for longer-term effects are the set-up of trails for autonomous teams. Since, meddling has been branded one of the most disruptive events for teams, it might be beneficial if a small group of team members got more authority. By starting to implement these teams on a trial and error basis, employees who are interested in this form of collaboration can participate and improve the structure to make it easier for every employee to in the future work in these unstructured environment. Even though it has been indicated that there should always be a balance between projects that focus on product for today's markets, tomorrow markets and the day-after-tomorrow markets, it will become more and more important for the new division to claim its position within the organisation. Therefore, more activities should be focused on finding that one product or services that is going to be disruptive to the internal or external market. This should provide the employees working for the other divisions with an improved understanding of why the new division has been added and shall make it clear of the organisation is adopting the American view of 'Industry 4.0' or the German view.

5.2. Limitations

Though, this research has been able to provide the case-organisation with a wealth of information, it should be noticed that there were a few limitations. One limitation is that only white-collar employees were asked to participate in this research. In general, having multiple reviews from different constituencies will aid in reducing bias and can contribute in providing more information on critical trade-offs (Cohen, 1994). Furthermore, this research only made use of self-reports. These reports are characterised by being a common method bias that is responsible for enlarging covariation between predictor and criterion (Hülsheger et al., 2009). At the same time, the interviews were conducted in the work environments of the employees which makes it difficult to control for external factors (Baarda et al., 2013). Another limitation is the sample size of participants. Within the new division alone over a thousand employees operate within the new 'Industry 4.0' environment. A sample size of 18 different employees provides a wealth of information and knowledge though this amount of participants might be considered to be too small to generalise the results. Additionally, the sample size has been decided upon by an internal employee of the case-organisation. Though, the sample did represent the different divisions and different working environments, it must be noted that the sample has not been chosen randomly since the internal employee is unlikely to have knowledge about how many and which employees participate in the 'Industry 4.0' environment.

Two other limitations are that this research chose the IMOI model to provide the framework for establishing team effectiveness in an 'Industry 4.0' environment. However, there are multiple other models that also measure

this construct with slightly different variables. The IMOI model for this research was one of the most comprehensive models to use. The fact that not much knowledge yet was gained on collaboration systems and the transformation of the industry meant it was important to use a comprehensive overview. Though, this does mean that there might still be other known variables that can even elaborate further on the answer how teams can establish team effectiveness in a 'Industry 4.0' environment. Besides limitations mentioned above it is also important to mention that the interviewer conducted the interviews in a non-native language of both the interviewee and the participants. This could mean that a language barrier might have influenced the results.

5.3. Future Research

This research has been able to add new knowledge to what is known about the 'Industry 4.0' environment. Though, 'Industry 4.0' is a research area that still has many questions to answer. Further research on how 'Industry 4.0' is going to impact humans working in this environment will be necessary. Since this was a qualitative research, it has not been able to research causation. Therefore, quantitative research within the domain of how team effectiveness in 'Industry 4.0' can be established to get an improved understanding of how causation in team effectiveness in the 'Industry 4.0' environment. Additionally, this research was done in an organisation that is characterised by being diversified. Thus, the case-organisation exist of four divisions focusing on different industries. All these divisions were also included within the research. Though, what could be interesting to research is if there are industries that are more interested in implementing 'Industry 4.0'. Additionally, research on how many different stakeholders can be involved in 'Industry 4.0' projects without having negative consequences for the team. Furthermore, a lot of participants indicated that they prefer to communicate face-to-face with the other team members. Though, an important point within 'Industry 4.0' is the man-machine communication. Therefore, how can man-machine communication become the preferred manner of communicating within an organisation.

Since this research has focused on the whole model of team effectiveness interesting research would also be research that is conducted in team processes and mediators. This research already provided interesting findings on team processes and mediators in the 'Industry 4.0' environment. A more focused research will most likely provide more knowledge about these different processes and mediators. Not to mention, the research opportunities still not explored that focus on how different degrees of automation, product complexity, value chains and productions technologies are influencing decision-making of the organisation (Pfeiffer, 2017).

6. Conclusion

This research has been able to give a first insight in how team members are experiencing the new 'Industry 4.0' environment and how that influenced their team effectiveness. The results show that the participants perceive 'Industry 4.0' as a possibility for their organisation to grow. Though, because it is a young phenomenon that is just implemented, it also provides some challenges for organisations. This research has therefore been able to pinpoint pain points surrounding team operations in the 'Industry 4.0' environment that decrease the team effectiveness. In this research, the most disruptive events to team effectiveness can be found in the IMOI variables organisational structure and team processes. It can be conclude that the existing literature on teams within the 'Industry 4.0' environment is scarce and advocates for the implementation of autonomous systems. Based on the results of this study this finding is confirmed since one of the most disruptive events on team effectiveness has been the meddling of stakeholders that have been involved in the teams. In most cases it provides the team with unclarity about expectations and goals. In the future, it is therefore important that before a team is going to start operating that attention is paid on providing clarity about expectations and goals surrounding the team. A side note should be made that in this case-organisation autonomous systems are not found to be a reality.

This research has also shown that not starting 'Industry 4.0' with a green field can provide problems. The case-organisations' new division has inherited such a large amount of products and services that it together with the limited amount of available resources has not yet been able to focus on finding a market disruptive new product or service. Additional this means that the division for some has not yet earned its position within the case-organisation. To conclude, this research has also given multiple managerial implications that could solve the pain points disrupting team effectiveness to ensure that future teams will perceive an increase in team effectiveness again.

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Appendix A – Interview Guide Interview Round 1

Could you please tell me about the process of the team composition?

- Why were certain departments involved in the team and others not?
- Could you tell me about your thoughts on the division man/woman in the team?
- How did a distinction/no distinction between age and educational level influence the team?
- The time taken to compose the team can be described as?
- How were the roles divided in the team?
- Could you tell me about your role in the team?
- How was it decided who would be the leader of the team?
- Whom decided that some employees could join the team and some could not?
- Why did membership of the team change/not change?
- How clear was it to you what the task of the team would be?
- Why did your own department and the teams expectations of how much work the team would take align/not align?
- If you could, how would you change the way the team composition was done?
- To summarise, what happened during the composition of the team that slowed the composition process down?
- To summarise, what happened during the composition of the team that sped up the process of forming the team?

Could you tell me about how the team operated during its existence?

- What are the three words you would use to describe the operations of the team?
- How could the general feeling in the team be described?
- Did the team behave as a unified team?
- Why did members of the team communicate with each other in the way they did?
- Why did the team members work/not work together?
- How were decisions made by the team?
    - Why was there freedom/no freedom to make decisions on your own?
- Why did the team members behave/not behave in a way that was expected of them?
- How much was the team influenced by factors of the overall organisation?
- How would you describe the leader of the team?
    - Three concrete words you would use to describe the leader?
- How invested was the team leader in the team?
- Why could the team members have felt that they had a personal stake in the success of the team?
- Could you describe the reward system of the group and of individual group members?
- To summarise, what were factors during the existence of the team that slowed the team down?

- To summarise, what were factors during the existence of the team that helped the team move along?

How could you describe the teams' outcomes?

- How long did the team exist for?
- Could you tell me how this team contributed to the organisation?
- Why were there certain expectations of the outcome of the team?
- How did the team members feel about the results of their team work?
- Could you explain to me how feedback has helped your team to improve outcomes?
- What was the team leaders' influence on the outcomes?
- To summarise, what were factors that slowed the team down in reaching their outcomes?
- To summarise, what were factors that helped the team to reach their outcomes?

Closing questions

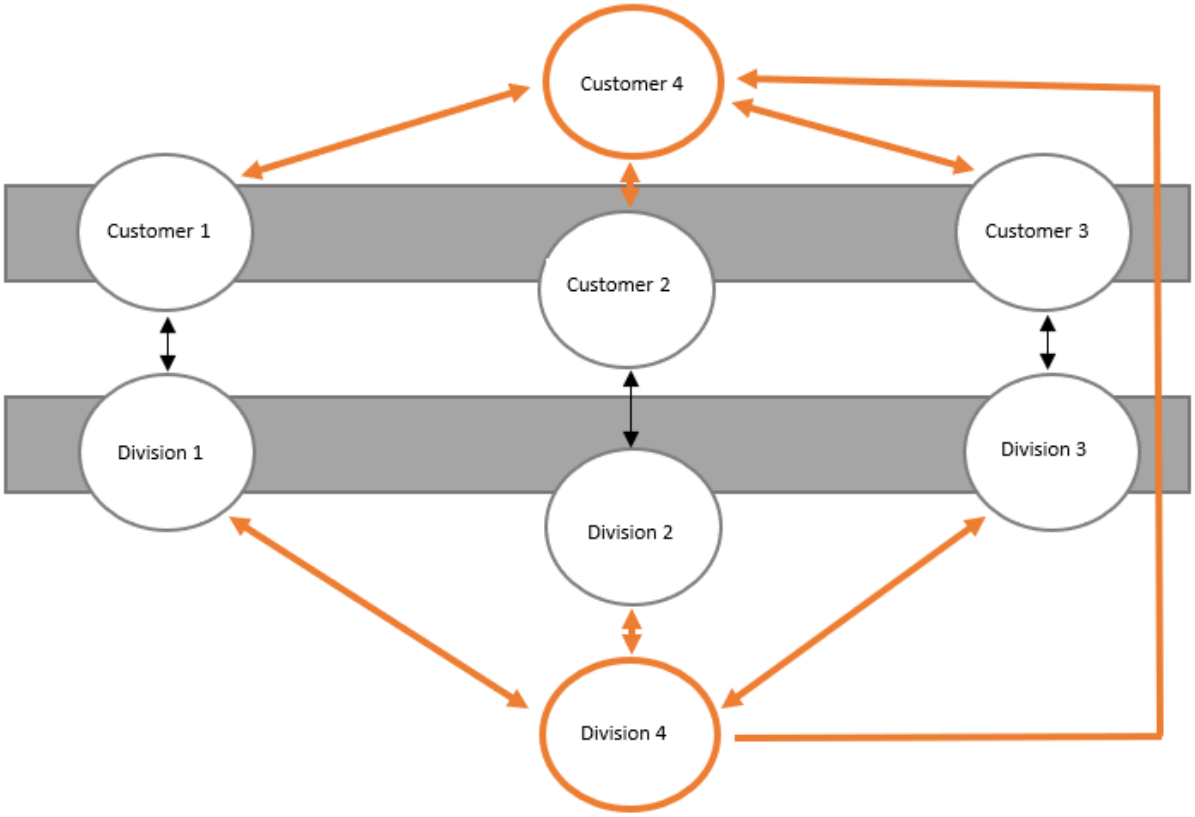
- Why is the role of the team leader important in teams operations?
- Why do you think team members can make the team a success or a failure?
- How can the overall organisation help teams to be successful?
- What did you learn from your team experience that you will take with you to new team collaborations?
- If the team has had his own autonomy what would improve?
- Could you in your own words explain what 'Industry 4.0' is and how it influences organisations?
- How clear is the importance of new smart product development in 'Industry 4.0' for you?
- Is there anything that has not be discussed yet but that you would like to discuss?

Appendix B – Interview Guide Interview Round 2

Inputs:

1. Organisational structure:

Multiple respondents have mentioned in the first round of interviews that the organisational structure of the organisation has changed since the introduction of the new division to facilitate 'Industry 4.0' product build. If you look at the model, how would you describe in how far you have noticed this organisational structure change?



In how far, do you think that the hierarchical structure used in the original divisions and the new matrix structure in the new division is disruptive to team collaborations?

During the first round of interviews a lot of different definitions were given regarding 'Industry 4.0', some respondents indicated that the organisation was not aiming for 'Industry 4.0' but for IoT. In how far do you agree?

What do you think are the consequences of employees having a different understanding of 'Industry 4.0' and the use of IoT in the organisation for successful team projects?

Could you explain to me how values, beliefs, but also accepted actions of individuals within the teams have changed since the new division was introduced?

2. Technology:

The first interview round has shown that a few respondents were not satisfied with the technological tools provided by the organisation to work effectively on their project. Do you have the same experience?

Could you explain which technological tools you think would improve your team work?

3. Organisational Resources

There were respondents who indicated that the organisation does not have the human resources needed to be able to make 'Industry 4.0' a success. What are your thoughts about this statement?

Have you noticed a change of the distribution of resources since the development of the new division that has had positive or negative consequences for your own work?

Which organisational resources do you miss and do you think could really give the organisation a competitive advantage in the 'Industry 4.0'environment?

4. Team composition

Since team size has ranged between 3 to 600 employees in one team, could you give me a definition of how you would define a team?

Do you think that teams should be differently composed now that 'Industry 4.0' plays a role in the product development?

In the previous interview, I asked if autonomous teams could be an answer for struggling teams. Most respondents indicated let's try it. A current definition of this phenomenon is that these teams are characterised by relatively whole tasks, range of skills among team members, and autonomy about how and when work is done (Parker, Johns, & Morgeson, 2017). What would you expect to benefit most from the introduction of these teams?

Would you prefer to have more freedom in a team?

Why would you agree or disagree with the fact that 'Industry 4.0' might be related to more team freedom?

It was agreed upon by all the respondents that in most cases the more heterogenic a group is, the more successful. What is your experience with teams that have become more diverse, because of a collaboration between employees of the new division and the original divisions?

Within teams interdependence is very important. Interdependence is focused on how dependent you are on others, how dependent you are on how distribution processes in the organisation and how dependent you are on rewards and feedback to be motivated. Could you explain in how far you think interdependence is important for you in team collaborations?

Do you mind to be interdependent of inputs, processes and outcomes of teams?

How doable is it to coordinate teams in this organisation?

Do you believe that the organisation needs to have different expertise's hired to the organisation to be successful?

One respondent in the first round of interview indicated that the organisation needs new expertise's to be able to facilitate 'Industry 4.0'. What is your opinion?

In the interview often it was mentioned that there were conflicts in the team. These conflicts were not always perceived as being negative for the operations in the team. When are conflicts not disruptive in the teams operations?

How would you manage conflicts in autonomous teams?

Mediators:

During the first interview, it was in detail explained what good leaders are in terms of behaviour and attitudes. It was also indicated that almost all the respondents only knew the process of appointed leaders by higher managements. Do you believe that leadership can emerge when you put a group of employees together and let them work on a well-defined goal?

What means organisational goal clarity to you?

What does team empowerment mean to you?

When is someone committed to a team according to you?

In the first round of interviews, trust has been brought up when referring to trust that a leader can gain from the team members and trust between divisions. Two respondents indicated that trust was good for a team to move forward. What is trust in a team for you?

How important is trust in a team for you?

Could you describe how adaptable current teams are at the organisation working in the 'industry 4.0' environment?

Have you been able to observe confidence in the new teams dealing with the 'Industry 4.0' environment?

Is it more difficult to get team members to have the same understanding of a situation or process in a team in 'Industry 4.0'?

How effective is team member communication in teams that operate in an 'Industry 4.0' environment?

Outcomes

If you look at the proposed model for this research, then there are three forms of outcomes that measure team effectiveness. What to you is a good group performance?

What to you are positive team attitudes as an outcome?

What to you is positive team behaviour?

Some respondents indicated that the organisation needs a big breakthrough in products. A new, innovative product needs to be developed is quickly as possible, because this will really support the organisation. Do you feel the pressure in this new 'Industry 4.0' environment that you need to build new and innovative?

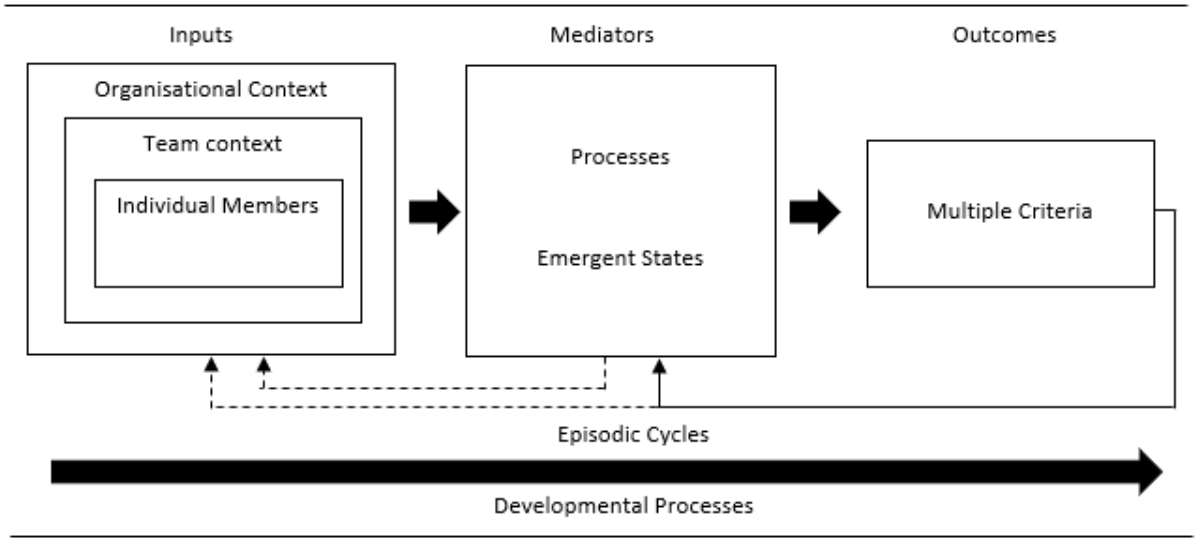
Episodic cycles

Now we have discussed the linear line of the model. Though it is believed that outcomes have influence on mediators and mediators have influence on inputs. How do you expect that outcomes will influence mediators?

How do you expect that mediators will influence inputs?

Final question

One last questions, if you look again to the model and perhaps have the last interview and this interview in mind, do you have something that you would like to added to this interview that has not been discussed yet.


Inputs
Mediators
Outcomes
Organisational Context
Team context
Individual Members
Processes
Emergent States
Multiple Criteria
Episodic Cycles
Developmental Processes

Appendix C – Interrater Reliability

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	,740	,104	6,282	,000
N of Valid Cases		41			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Appendix D – Invitation Mail

Dear …,

Aligning our DS interests (with VT, VP, VH) is a key driver for a project success. Tension arise since DS is operating in a new force field of “New Business Models”, “Scalable Technologies” & “Fast time to markets” and at the same time DS is largely dependent on the resources of the other group divisions to successfully launch new products. Since these dynamics are complex, and we’ve gained our first project experiences, it is important for us to evaluate and learn. What should we nurture and what should we avoid? To answer these questions Madelynn Wanschers has started her Master thesis at Strategic Design.

Her research question: “What are the ingredients of a successful cross-functional project group in a diversified organisation moving into ‘Industry 4.0’?”.

To answer this question she would like to have an interview with you of about an hour. I hope you are OK that she soon will contact you?

PS. If your time is scarce feel free to suggest another interesting colleague.

Freundlich Grüße / Best regards,

Appendix E – Informed Consent Form Interview Round 1

Dear madam/sir,

Thank you for your willingness to participate in this interview.

The Strategic Department of Digital Solutions has started a research project to explore why some cross-functional project teams are successful and why others struggle in their way to success in the 'Industry 4.0' environment. Your experience with successful and struggling cross-functional project teams will be compared to existing scientific knowledge on teams to develop a model that will support the composition of successful cross-functional teams in the future. The interview will take an hour and exists of two sessions. Both sessions will take about half an hour. The first session will be about a successful cross-functional project team and the second will be about a struggling cross-functional project team.

During the interview you will be asked open questions and to further explain your thoughts. You have the right to stop the interview without giving a reason in case you are not willing to co-operate further in the research. During the interview, the interviewer will make notes. The interview will also be recorded. This recording will only be used by the researcher to construct an overview of the held interview. The overview will be send to you so you can give approval on the correctness of the summary. After your approval, the recording will be deleted.

All the information received during the interview session will be handled with confidentiality. This will mean that the information used in the research cannot be referred back to you. If you have read the above text and have no remaining questions, please sign this form on the dotted line to indicate you understand the following:

- I understand the purpose of the research as described above and know what is expected of me.
- I understand that the interview will be recorded and that these recordings will only be used by the researcher.
- I understand that I participate freely in the research and that I have every right to leave whenever I want, without giving a reason.
- I understand that the research results will be anonymised.

……..

If there are any questions after the interview, you may contact Madelynn Wanschers at …… or m.e.a.wanschers@student.utwente.nl

Appendix F – Informed Consent Form Interview Round 2

Dear madam/sir,

Thank you for your willingness to participate in the second round of the interview.

As you know the Strategic Department of Digital Solution started a research project to explore why some cross-functional project teams are successful and why others struggle in their way to success in the 'Industry 4.0'environment. The first results have been analysed and based on the knowledge gained by scientific literature this follow-up interview is held. This interview will take no longer than an hour.

During the interview you will be asked open questions and to further explain your thoughts. You have the right to stop the interview without giving a reason in case you are not willing to co-operate anymore in the research. The interview will be recorded. This recording will be used to transcribe the interview. This transcription will be used in the analyses. All the information received during the interview session will be handled with confidentiality. This means that the information used in the research cannot be referred back to you. If you read the text above and have no remaining questions, please sign this form on the dotted line to indicate you understand the following:

- I understand the purpose of the research as described above and know what is expected of me.
- I understand that the interview will be recorded and that these recordings will only be used by the researcher.
- I understand that I participate freely in the research and that I have the right to leave whenever I want, without giving a reason.
- I understand that the research results will be anonymised.

……..

If there are any questions after the interview, you may contact Madelynn Wanschers at m.e.a.wanschers@student.utwente.nl

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