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Exploring how Socio-technical Systems support Organizational Learning

- A Case Study of a Global Manufacturing Corporation

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Abstract

Title	Exploring how Socio-technical Systems support Organizational Learning: A Case Study of a Global Manufacturing Corporation
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Date	19 th of May, 2023
Aim	The aim of this paper is to explore how the utilization of socio-technical systems align individuals and technology, fostering a conducive environment for organizational learning.
Methodology	This research is a qualitative study following an abductive approach and a symbolic interactionist tradition. The empirical data consists of eleven semi-structured interviews, all with managers in a global manufacturing organization.
Theoretical Framework	The theoretical framework consists of previous research on organizational learning, competency mapping and the digital learning environment. It also presents research on socio-technology and how it is used for organizational learning and factors relating to the adaptation to new technology.
Contributions	An understanding of the concept of socio-technical systems in relation to organizational learning, shedding light on optimal utilization scenarios and identifying key enabling factors for their effective implementation. It emphasizes the significance of the cyclical process of adapting and harmonizing with socio-technology systems to fully take advantage of its benefits.
Keywords	Organizational learning, socio-technical systems, digital learning environment, competency mapping.

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1. Introduction

Over the past few years, significant changes have occurred in various aspects of our lives. The outbreak of Covid-19 forced us to work remotely and maintain distance from one another, and the emergence of technical advancements has started to impact numerous facets of our society. Klaus Schwab, a prominent scholar, has termed this to be the starting shot of the development towards the *Fourth Industrial Revolution*, which is believed to be the most significant transformation in modern history (Schwab, 2016). In the current scenario, we no longer need to memorize information, as we have access to the world's knowledge at our fingertips. Technical skills required for operating manufacturing machines will potentially soon be redundant as the machines become self-taught and will not require human physical presence for maintenance. With the diminishing physical proximity, the role of technology in organizational learning becomes paramount. How does the utilization of socio-technical systems align individuals and technology, fostering a conducive environment for organizational learning?

The constant technological advancements require organizations to be agile and proactive in managing this transition in the most efficient manner (Rêgo, Jayantilal & Ferreira, 2021). The recent years have witnessed a notable increase in digital transformation (Rêgo et al. 2021), primarily attributed to the profound impact of the pandemic (Ozimek, 2020). The multinational consulting company McKinsey presented a report on the state of work after Covid-19. Like others in the field, they emphasized the swift and abrupt adjustments that were necessary in response to the pandemic. While the most noticeable changes, such as the shift to remote work and implementation of new protocols, should not be overlooked, McKinsey (2021) emphasizes on the long-term impact of the pandemic. The report highlights on how the disruption foremost promoted new technology to be developed, but consequently also on the significance of physical labor. They predict that remote and virtual work will become a permanent fixture in the work environment (McKinsey, 2021).

In terms of a radical shift in approach, the Fourth Industrial Revolution holds a prominent place in this discourse. According to Xu, David, and Kim's (2018), the fourth industrial revolution is characterized by the integration of digital and offline work processes through the use of technology. Maynard, (2015) describes the fourth industrial revolution being both the independence and combination of digital, physical and even biological technologies used to change the producing industries. This revolution is also said to exceed in a pace not like the

others, which can be evident from e.g. the drastic and immediate changes created by the pandemic (Ozimek, 2020). Maynard, (2015) describes the fourth industrial revolution to be in its beginning stage and is said to consist of e.g. transformative software and new ways for human and machine interaction. Xu, David and Kim (2018) conclude their study by indicating that the changeover that is about to take place, or is starting to, will be the biggest and most significant industrial revolution to date. Maynard, (2015) shares a similar view and states that the change we can see now and predict to be in the future is only the tip of the iceberg of what is actually going to transpire. The scale and complexity of this revolution will therefore also bring significant opportunities but foremost challenges in the way we live and work (Xu, David & Kim, 2018). Last notable contribution from Xu, David and Kim's (2018) research is the claim that collaborative and organizational innovations will take new form in the fourth industrial revolution. With this being said, the digital transformation is evident and can be explained from factors such as the general and constant technological advancements in our society and Covid-19. This leads to the question of how this transition impacts and shapes organizational learning. In line with this transformation, so has the way in which individuals learn in an organizational context, due to people not interacting and communicating in the same way. As a result organizations hoping to do well and stay relevant in today's world, have to learn faster and more efficiently than ever before (Serrat, 2017), which could clearly challenge organizations.

The technical solutions for organizational learning can have numerous benefits, however, organizations will have to be careful of the balance between people and technology (Kimiloglu, Ozturan & Kutlu, 2017). Mumford (2001) highlights the need for careful employee management during technology implementation, emphasizing the role of management in digital transformation and adaptation. Technology enhances knowledge storage and sharing, leading to significant time and cost savings (Basten and Haamann, 2018), while fostering a flexible work environment and improving overall efficiency (Kimiloglu, Ozturan & Kutlu, 2017). Technology is also explained to facilitate the knowledge flow (Giannakos, Mikalef & Pappas 2019). However, the challenges associated with the inability to utilize technology or the absence of demonstrable improvements to organizational learning resulting from its use have not been adequately communicated.

It is evident that technological progress is a reality, but as noted by Stein and Vandenbosch (1996) people and technology do not advance at the same pace. Therefore, an important factor in ensuring a successful adaptation to new ways of working or new technology, socio-technical

approaches needs to be taken into consideration (Stranks, 2007). Aligning people and technology is vital for the two to cooperate efficiently and according to Mumford (2001) it is important to give equal attention to both aspects. Employing socio-technical systems involves aligning people and technology, ultimately leading to the development of more efficient and user-friendly systems, and consequently, a more high-performing organization (Stranks, 2007). If the technology is excessively complicated and difficult to use, it may not always be welcomed by the employees which can hinder its usage and usefulness. Being proactive in promoting the benefits of the technology and to motivate their workforce to embrace the change can be imperative in creating an environment conducive to successful adoption (Trenerry, Chng, Wang, Suhaila, Lim, Lu & Oh, 2021; Mumford, 2001). Organizations that strive for efficient learning, need to strike a balance between itself, its people, knowledge and technology (Serrat, 2017).

We focus our study in the environment of a global manufacturing organization, consisting of interviews with managers that work closely and related to organizational learning utilizing technology. The aspect of organizational learning in a global manufacturing organization is a specific situation and environment where socio-technology-enhanced organizational learning can be argued to be challengingly implemented, due to its high level of physical proximity. The choice of a global manufacturing corporation as a case study therefore serves the purpose of emphasizing and more clearly shining light on the contradictions to previous studies of the benefit of using socio-technology for supporting organizational learning. Studying organizational learning in a manufacturing organization, after the disruption from the Covid-19 pandemic along with the emergence of new technology for learning additionally provides a nuanced perspective.

This paper aims to explore the utilization of socio-technology for organizational learning, and additionally served the purpose for the managers to reflect actively how they handle and manage knowledge in the sense of technology in manufacturing cooperatives. When technology and people are not operating in tandem, it is important to understand the factors that contribute to their disconnection. This thesis explores where technology serves a useful purpose, identifying underlying reasons why and where adoption and utilization of technology for organizational learning is unjustified. Our research question, therefore, is as follows:

- *How does the utilization of socio-technical systems align individuals and technology, fostering a conducive environment for organizational learning?*

1.1 Outline of the Thesis

This thesis is divided into six sections, beginning with this introduction. In our introduction section we have explained the purpose of our research as well as given a brief description on our topic. Following the introduction we will present existing literature in section two on the topic of organizational learning, which includes a discussion on explicit and tacit knowledge, competency mapping and digital learning environment. Additionally, we will present the topic of socio-technology and the aspect of learning in that sense as well as important factors relating to adaptation towards technology. In section three we will present our methodology which includes all relevant information on how we performed our study, beginning with our philosophical grounding. Following that we will explain how we approach this study, how we collected our data, how we analyzed it. Then we explain how we ensured all ethical and credibility issues were in order and discuss reflexivity. Furthermore, in section four our findings are presented building on our interviews and we highlight our findings by using quotes from our respondents. Section five combines section two and four with a discussion bringing together our existing literature and our findings. Lastly, in section six we conclude our thesis with our theoretical and practical contributions, limitations of this study and possibilities of future research.

2. Theoretical Framework

The following section provides the theoretical framework this thesis is based on. The theoretical framework consists of what has previously been studied in the scope of organizational learning, which includes the sub-headlines: Explicit and Tacit Knowledge, Competency Mapping and Digital Learning Environment. In addition, we touch upon the topic of socio-technology, which includes the sub-headlines: Socio-technical aspects of learning and Adaptation to Technology. The books, articles and other sources used in this section have been systematically chosen to fit the scope of organizational learning with technology.

2.1 Organizational Learning

Organizational learning can take various forms and be described from different viewpoints (Hislop, Bosua & Helms 2018). Learning can occur in different modes, processes and levels that ultimately explain the relationship between individual and group, thus eventually defining the concept of organizational learning. While there are various different interpretations of the term, it is important to establish a common understanding of the concept to ensure that discussions are productive and meaningful. Hislop, Bosua and Helms (2018, p.94) suggest a firm but clear definition, as the following:

“The embedding of individual- and group-level learning in organizational structures and processes achieved through reflecting on the modifying the norm and values embodied in established organizational processes and structures”

Additionally, the primary focus of organizational learning, as described by Jonsson (2015) is how members within an organization learn by monitoring how individuals learn and follow in their approach and whether it can be transformed into organizational learning. Therefore, organizational learning focuses on contributing to the process of individuals learning and the theory behind it. Furthermore, the learning organization explained by Jonsson (2015) is where the organizational context contributes to more learning and the sharing of knowledge, and therefore, contributing to practice and fostering a learning environment.

Organizational learning can also provide a competitive advantage and is developed when new and diverse ways of thinking are fostered (Argote & Hora, 2016; Stein & Vandenbosch, 1996). The medium or system in which the learning occurs is crucial for maximizing the benefits of

organizational learning (Stein & Vandenbosch, 1996). Škerlavaj, Dimovski, Mrvar and Pahor (2010) additionally explains how the performance of a company can be directly connected to the level of organizational learning within the company; the higher level of acquired and used knowledge, equals a better performing company. Argote and Hora (2016) discuss organizational learning from the perspective of management of technology. They identify three key components where knowledge is embedded: members, tasks and tools. The level of advantage provided by this embedded knowledge varies depending on its location. Specifically, knowledge embedded in transactive systems tends to be a stronger source of competitive advantage compared to knowledge embedded in routines or tools (Argote & Hora, 2016) As a result, it is important to establish and improve these systems to create opportunities for competitive advantage. Furthermore, organizational learning enables corporations to create and acquire new knowledge, develop and refine said knowledge and share their ideas (Ruel, Rowlands & Njoku, 2021).

2.1.1 Explicit and Tacit Knowledge

The understanding of explicit and tacit knowledge is important to grasp hence technology for learning requires the knowledge to be transferable through the systems. Hislop, Bosua and Helms, 2018 explain that knowledge is easier shared when being explicit. However, Panahi, Watson and Partridge (2013) explain that social web-tools do provide several beneficial features for facilitating the sharing of tacit knowledge. Nonaka, Toyama and Konno (2000 cited in Hislop, Bosua & Helms, 2018, p.17) provides a short but dense explanation of what explicit knowledge and tacit knowledge is:

“Explicit knowledge can be expressed in formal and systematic language and shared in the form of data, scientific formulae ... in contrast, tacit knowledge is highly personal ... subjective insights, intuitions and hunches fall into this category of knowledge.”

Panahi, Watson and Partridge (2013) explain that sharing tacit knowledge through technical systems is met with a lot of challenges, such as it being time consuming, language barriers and the knowledge losing its value when it is shared. Nonetheless, Hislop, Bosua and Helms (2018) also explain that Information technology can engage employees and capture their knowledge, thus making it explicit. In other words, objective knowledge can be created if it is taken from the subjective individual. Another aspect is that explicit knowledge can, in some instances, be

preferable to tacit knowledge hence it is not subjective and free from interpretation from the individual (Panahi, Watson & Partridge, 2013). Tacit knowledge is affected by external and internal factors such as organizational culture, environment and individual elements. Explicit knowledge can be objectively presented while tacit knowledge is highly personal, therefore being affected by physical and cognitive skills that the person obtains (Panahi, Watson & Partridge, 2013). On the contrary, Panahi, Watson and Partridge, (2013) provide several aspects of how social technology can facilitate the sharing of tacit knowledge, such as triggering the social and informal communication and simplify the process of being connected to others. They also provide an insight in how technology can be used to overcome possible language barriers. The epistemology that explains tacit and explicit knowledge also discusses that the difference of the concepts is sometimes hard to distinguish and not always obvious. There are even contradictions whether different kinds of knowledge are on a spectrum or if the two different kinds (explicit and tacit) represent two separate types of knowledge (Virtanen, 2013), which introduces a new perspective on the sharing and transfer of different knowledge domains, adding a new dimension to the discussion. If we consider it as a spectrum, transferring or even classifying the type of knowledge becomes more challenging.

From these insights, there is a contradiction on whether the mode of knowledge is crucial for it being shared over technical systems. Panahi, Watson and Partridge, (2013) explain that the sharing of tacit knowledge is time consuming and inefficient while sharing explicit knowledge is easier and more efficient. However, as mentioned earlier, technology can provide several benefits for sharing tacit knowledge (Panahi, Watson & Partridge, 2013). In scenarios where explicit knowledge sharing is more effective, it becomes essential to consider knowledge management and especially making tacit knowledge into explicit and then systemizing it. Nonaka, Toyama, and Konno (2000) describe the process of converting tacit knowledge to explicit knowledge as externalization. This is one of the four processes in the SECI model, which includes socialization, combination, and internalization. Socialization involves transferring tacit knowledge between individuals through knowledge conversation. Combination involves the interaction and systematization of explicit knowledge. Internalization is the process of converting explicit knowledge back to tacit knowledge (Nonaka, Toyama, & Konno, 2000). Gourlay (2006) adds that internalization can be described as learning by doing.

2.1.2 Competency Mapping

Competency mapping refers to the process of analyzing and understanding the competencies that exist within a company (Kaur & Kumar, 2013). It is also used to map out possible gaps and determine the actual to the required level of knowledge possessed by an employee. Kaur and Kumar (2013) explain that the concept competency consists of 4 key components, these being: skills, knowledge, personal attributes and behavior. A skill is described to be the capability to do an activity, knowledge is the theoretical understanding and personal attributes are determined by individual characteristics (Kaur & Kumar, 2013). Behavior is described by Kaur and Kumar (2013) the demonstration of a person's skills, knowledge and attributes, combining the first three elements into the last. A competency can be defined as “A Competency is a set of Skills, related knowledge and attributes that allow an individual to successfully perform a task or an activity within a specific function or a job” (UNIDO, 2002 cited in Yuvaraj, 2011, p.2) which share similarities to Kaur and Kumar, (2013) description.

Competency mapping serves several purposes. Kaur and Kumar (2013) describe it to enable personal development and establish what is expected of the employee, which then results in a shared vision, strategy, and improved job satisfaction. It is also said to be a key factor in order to communicate what is required for efficiently performing different roles within the organization (Yuvaraj, 2011). Detecting knowledge and skills gaps brings together the organization and the people, thus facilitating their relationship (Yuvaraj, 2011). In addition, Yuvaraj (2011) explains that there is an increase in knowledge based jobs today which emphasizes the importance and benefits of using competency mapping. Lastly, Yuvaraj (2011) provides a contradicting explanation that competence only describes *what* a person can do, not *how*. Furthermore, Boucher, Bonjour, and Grabot (2007) also highlight the significance of managerial efforts to link competence with performance. The relationship between competence and performance is determined by two primary methods: descriptive availability of knowledge and dynamic view of knowledge (Boucher, Bonjour, and Grabot, 2007). The indicators for the impact on performance are the availability of competence and the influence of competence on performance. However, the findings of Boucher, Bonjour, and Grabot (2007) do not provide a structured approach to effectively measure or ascertain the extent to which competence plays a significant role in performance.

Furthermore, Bhasin and Sharma (2018) explain that the use of competency mapping is the process of aiming to identify whether there are gaps in performance or skills. With that

managers can provide training in order to attempt to fill those gaps. The knowledge and understanding gained from competency mapping and gap analysis can aid employees in seeing what they have to work in order to improve their performance. Moreover, Bhasin and Sharma (2018) mention that by determining what skills and competencies the employee has to work on, training material and needs can be identified. A method such as this one can aid in ensuring that the training is based on need, is goal-oriented and fruitful (Bhasin & Sharma, 2018). There is a abundance of research on competency mapping models and approaches and subsequently identifying gaps. However, difficulties arose when searching for competency mapping with the use of technology that incorporates the mapping, analyzing gaps and provision of learning material to employees. There are recent studies and books that explain competency-based human resource management (CBHRM) that is an approach of human resource management (HRM) which focuses on the individuals themselves, their behaviors, attitudes, and performance rather than solely on the jobs themselves (Aungsuroch, Gunawan & Fisher, 2022). The aim with CBHRM is to identify and match the skills of the employees with their positions (Aungsuroch, Gunawan & Fisher, 2022). Sharma and Malodia (2022) state that human resource information systems (HRIS) can be beneficial in order to gather, analyze and distribute information about the employees. Additionally, they explain that a competency-based approach is a feature that can be integrated into HRIS. The findings of their study indicate that the integration of competency based approach within HRIS is proven to be essential for offering pertinent information on employees as well as in identifying competent individuals to achieve success.

Munthe, Baswardono and Satria (2019) researched how they could implement a CBHRM approach with information technology by creating a digital dashboard model in order to identify competencies and gaps. They explain that a CBHRM system can be useful since it includes data of all competencies, profiles of competencies, employees' competencies and HRM applications. In order to use a system that incorporates employee information and competencies they first needed to identify what competences the system needed to have. Following that, a competency profile which means each competence is connected to or needed for each position. Next, a competency matrix which enables you to comprehend the level of proficiency required at various organizational levels. Based on the competency matrix it is possible to determine the position matrix, which is how the competencies relate to positions. With that, the system can design the competence dashboard, which includes a talent dashboard and there the employees in the same position are ranked. Another feature of the competence dashboard they can identify

the competence gap. There the employee can see their individual profile, competency gap and competency that needs to be developed. The third feature within the competency dashboard, the employee can see how they compare to other employees in similar positions. Based on their findings, this dashboard is beneficial in analyzing competencies of employees and who is right for each position (Munthe, Baswardono & Satria, 2019). That said, the findings of this study gives a clear insight into competency mapping with the use of technology. However, we have yet to see a CBHRM system that combines competency mapping, gap analysis and how the system aids in providing training material to employees in order to address those gaps.

2.1.3 Digital Learning Environment

To be able to use the acquired knowledge within an organization, regardless of the situation and desired outcome, an important aspect is keeping up with the contiguous change and new information (Serrat, 2017). Understanding the aspect of what is lacking in an organization in order to keep up with the development is vital and needs to be comprehended to understand the dynamic of digital learning. If companies disregard the importance of digital transformation, they risk not accompanying the development (Rêgo et al. 2021). Individuals in corporations are therefore in need of guidance in the on-going developing environment (Rêgo et al. 2021). The digital transformation can also be argued to be a somewhat new phenomenon, hence it being catalyzed from the pandemic (Rêgo et al. 2021). Although digital transformations have gained significant attention in literature, there is still a lack of research that explores the intersection of people and technology in manufacturing operation with a digital lens. This research gap highlights the need for further investigation into socio-technical perspectives in manufacturing organizations.

In addition, a prominent aspect of the learning environment is the change caused by the Covid-19 pandemic (Ozimek, 2020). The Covid-19 pandemic has had a profound impact on the way we work and learn, accelerating the adoption of remote working and driving a digital transformation across various industries (Ozimek, 2020; Savić, 2020). The restrictions imposed by the pandemic have impacted all possible work-related interactions, with remote workers having to rely solely on digital communication channels to collaborate with their colleagues (Savić, 2020). The Covid-19 pandemic has had a profound impact on the way we work, accelerating the adoption of remote working and driving a digital transformation across various industries. This adaptation has involved a rapid evolution of the work environment and required companies to optimize the utilization of contemporary information technology, including e.g.

e-learning, video conferences and IT (Savić, 2020). The lack of physical interaction has necessitated the use of new technologies that support remote collaboration, but it has also highlighted the importance of face-to-face interaction in the workplace (Savić, 2020). In summary, digital transformation is a continuous process that companies must consider to remain viable. The Covid-19 pandemic has accelerated this transformation, resulting in a faster and more radical shift towards digitalization (Ozimek, 2020; Savić, 2020).

Maghsoudi-Ganjeh, Khani and Alem-Tabriz (2021) also explain that networking capabilities positively affect a company's commercial performance. It is therefore important to explore and understand the aspect of how, where and when learning occurs, in other words: what creates a learning environment. It also holds significant importance given that the way we interact has undergone drastic changes over the years (Ozimek, 2020; Savić, 2020). Škerlavaj et al. (2010) suggest that learning occurs when individuals participate in communicative activities as well as when prior knowledge is used. Learning is also greatly influenced by the environment and foremost who you are surrounded with; this also means that stationary people that rarely change environments or encounter new people are at risk to not take on as much new information or practices, as those who regularly change environments (Škerlavaj et al. 2010). In order to acquire the already obtained knowledge, Škerlavaj et al. (2010) therefore emphasize on the importance of *learning networks* and that they serve a fundamental role to the learning environment. Learning networks contribute with a solution to the problems created by people being stationary and not encountering new people at the workplace. Well implemented and accessible networks encourage and foster a learning environment which then results in a better performing company (Škerlavaj et al. 2010).

Giannakos, Mikalef and Pappas (2019) additionally describe learning environments being highly influenced by collaborations, and that technology fosters such an environment by facilitating the knowledge sharing possibilities, or as they also call it: the knowledge flow. The knowledge flow or learning environment can also be described as being a combination of the individual and organizational learning, thus creating collaborative learning possibilities and a learning environment (Giannakos, Mikalef & Pappas, 2019). Campana (2014) additionally explains that the learning networking can utilize personal, professional development and that the learning environment in which the networking occurred was a mixture of both face-to-face and digital interactions. This statement emphasizes that even though the learning environment has shifted towards a more digital approach, technology can facilitate this new environment.

In addition, a noteworthy aspect in the sense of this thesis is the situation when the learning environment occurs on a global level. Javernick-Will (2009) explains the challenges of acquiring and comprehending knowledge in a time of internationalization. He claims that when knowledge is acquired and developed from sources such as external relationships and clients, it is important to adapt the knowledge to where it will be used. Javernick-Will (2009) says that the created knowledge can be somewhat tacit as it is influenced by cultural and normative factors, and therefore needs to be revised and readjusted to be aggregated and fit in new places. In situations where knowledge is created and obtained on a global scale, it is important to make sure that the knowledge is suitable and useful for specific, local situations (Javernick-Will, 2009). Nonetheless, Eriksson, Johanson, Majkgård and Sharma (2000) claim that the variation and accumulation of knowledge acquired on a global scale can be an advantage and benefit the company. When a company is operating on a global scale, their ability to absorb and develop knowledge increases (Eriksson et al. 2000), since the variations interplay with people's ability to understand different kinds of practices. Eriksson et al. (2000) and Javernick-Will's (2009) standpoint is somewhat contradicting, as one emphasizes the importance of adapting the knowledge, and the other sees the advantage of being able to use different kinds of knowledge.

2.2. Socio-technology

According to Stranks (2007), the concept of socio-technical or socio-technical systems (STS) involves the interplay between individuals and technical systems within an organization. Stein and Vandenbosch (1996) suggest incorporating more *socio-technical* perspectives in learning organizations to better align technology and people, as they do not always advance in tandem. The underlying idea, as outlined by Stein and Vandenbosch (1996), is that learning can be executed in many different ways, depending on the circumstances and desired outcome. STS are typically utilized to improve system efficiency and user satisfaction, making them a popular tool in the areas of organizational development and change management (Stranks, 2007). By emphasizing the importance of the relationship between people and technology, STS can help organizations create more effective and user-friendly systems that support their goals and objectives. Stranks (2007, p.100) further explained STS to serve an important role “to improve the performance of the organization by adding shareholder value, increasing productivity and competitiveness.”

Additionally, Mumford (2001) argues that in order for socio-technical approaches to be effective in the workplace, equal attention must be given to both the social and technical

aspects. When implementing new technology, it is essential to consider the readiness of the individuals involved, as a high-functioning work environment is critical to the success of any technological change (Mumford, 2001). Without a supportive and receptive work environment, technology may prove ineffective. By emphasizing the social dimension of socio-technical approaches, organizations can create a more conducive environment for the adoption and implementation of new technology (Mumford, 2001). Bednar and Welch (2019) additionally state that all socio-technical approaches must originate from a people-perspective. In order for individuals to use their skills and knowledge their context and environment must be functioning. Additionally, for STS to be effective it is important to implement and co-create them to be meaningful and adapted to their users (Mumford, 2001). This approach recognizes the importance of considering the human factor in technological change, and the critical role that the organizational environment plays in shaping attitudes towards innovation.

Moreover, Turulja and Bajgorić (2018) highlight the significance of transparency and open dialogues in effectively managing knowledge. They argue that employees' willingness to be transparent and open has a direct and positive impact on the way knowledge is managed (Turulja & Bajgorić, 2018). Open dialogues are considered a component of the social aspect of work and especially in the sense of organizational learning (Turulja & Bajgorić, 2018). As mentioned earlier, the digital transformation has changed the way of communicating within companies, and with the new ways of sharing knowledge and information, the open dialogue has also changed the approach. Mumford (2001) explained the importance to consider the readiness of the employees and this can also be applied for the ability to communicate with new technical systems or tools. Sita and Chitale (2012) hold a similar perspective on knowledge sharing within organizations. They assert that face-to-face interaction remains crucial, but acknowledge the significance of developing programs and systems that facilitate knowledge sharing (Sita & Chitale, 2012). In essence, they emphasize the importance of utilizing both the social and technical components of communication.

Additionally, Fuchs and Reichel, (2023) explain the challenges of maintaining effective communication when working remotely and with more technical aspects. Their research outlines what happens when face-to-face interaction is diminishing when the work environment is going towards a more digital approach. Fuchs and Reichel, (2023) explain that communication can both be more efficient but also ineffective with the use of digital tools. Technology enables fast and unscheduled communication but can be suffering if the employees are inconsistent or take too long time to communicate back. In other words, technology can

foster communication and organizational learning if the practice of using the systems is there (Fuchs & Reichel, 2023). This also tangents with Mumford (2001) statement of taking into consideration the readiness of people when letting them use technical programs and systems.

2.2.1 Socio-technical aspect of Learning

As Serrat (2017) points out, an organization's ability to learn and share knowledge is crucial for its success and survival. A prerequisite for that to be achieved, it is important to support the organization as a whole: its people, their knowledge and technology for learning (Serrat, 2017). When it comes to technologies for learning, Basten and Haamann (2018) discuss two technological approaches to organizational learning, virtual world and knowledge repositories. Knowledge repositories are explained as a system of storing and sharing knowledge. They enable employees to learn explicit knowledge which comes in the form of e.g., documents that other employees have shared within that system and in turn stimulates the manifestation of tacit knowledge. Knowledge repositories are not only beneficial as storing systems, other forms can encourage collaboration and communication between employees (Basten & Haamann, 2018). The other technological approach to organizational learning that Basten and Haamann (2018) discuss is virtual worlds and that is where individuals interact with each other in electronic environments. There, individuals can learn from past experience and from other individuals, therefore, they can learn, access, and share existing tacit and explicit knowledge (Basten & Haamann, 2018).

There can be numerous benefits when using technology when it comes to organizational learning. They can be beneficial for analyzing task-completion, satisfaction, and how that system is enhancing performance (Kimiloglu, Ozturan & Kutlu, 2017). In addition, Kimiloglu, Ozturan and Kutlu, (2017) note that putting in place technological learning systems to promote organizational learning can be a significant time saver, enhance flexibility and efficiency and as a result, lower costs for training employees. Therefore, though technology has many benefits when it comes to organizational learning, it also comes with challenges and obstacles, such as integrating people and technology and ensuring a successful adaptation to these systems.

Giannakos, Mikalef and Pappas (2019) explain the term TEOL - Technology-Enhanced Organizational Learning, as a way of describing the theory behind integrating technology and organizational learning. They discuss the affordance and contribution of technology for organizations and emphasized the importance of aligning the system to the organization in

order to actually have a contribution. Another aspect, presented by Giannakos, Mikalef and Pappas (2019) is how technology facilitates the knowledge flow in an organization and in order for a successful implementation it is important to take into consideration the employees adoption process and user experience. The theory behind TEOL also presents implications such as lack of research of the creation of materials used in the systems; where the data is collected and how the lack of data can limit the learning (Giannakos, Mikalef & Pappas, 2019). In summary, technologies for learning is a broad collective word that implies many different tools, systems, and channels. Technology for learning is proven to enhance organizational learning in several aspects, but at the same time poses challenges and implications.

2.2.2 Adaptation to Technology

As established, the Covid-19 pandemic changed the workplace entirely. There was a need for rapid adaptation to this change, which was followed with numerous challenges (Buheji & Buheji, 2020). There is a need for companies to adapt to this rapidly changing work environment and to integrate new technologies in order to remain competitive in the market (Trenerry et al. 2021). Furthermore, when an organization is going through a technological change or development, there needs to be a strategy in place in order to evaluate and manage the employee's readiness and attitudes. Trenerry et al. (2021) discuss Davis' (1989 cited in Trenerry et al. 2021) Technology Acceptance Model (TAM) which is a model used to predict an individual's attitudes and beliefs in the technology. The first indicator of how much a person will use a technology is how valuable they perceive it to be, and the second is how user-friendly they perceive it to be (Trenerry et al. 2021). Therefore, managers will have to take great care and observe employee attitudes and overall wellbeing when going through digital change or development. Furthermore, according to Dutta and Borah (2018 cited in Trenerry et al. 2021) several factors can have an impact on whether the adoption of new technologies will be successful or not. They state that age, gender and the experience of the individual could have a significant impact on the adoption process and how that individual's experience unfolds. In their study, they found that male employees were comfortable with the usage of new technologies in the workplace while women were more excited for technological change. However, contrary to popular belief, they found that older workers who had been working in the company approximately 20-30 years were quite satisfied with the usage of technologies at work, however individuals who had worked more than 30 years could be more hesitant towards it. This goes to show that there could be numerous factors that can influence how an individual

receives and believes in new technologies used in the work-environment and it can be difficult to generalize on this topic (Dutta & Borah, 2018 cited in Trenerry et al. 2021). That said, Trenerry et al. (2021) found that employees are more inclined to adapt well to new technologies or systems if they believe it would benefit their work, improve their performance, and be simple to learn and use.

Additionally, when a company undergoes a digital transformation, it is not only crucial for the employees to view the change favorably, the managers or leaders should take the lead in inspiring and motivating them. Furthermore, Dery et al. (2017 cited in Trenerry et al. 2021) states that managers need to be continuously engaging in conversations with their employees to gather their feedback and concerns of what needs to be improved. Cortellazzo et al. (2019 cited in Trenerry et al. 2021) explains five key characteristics of an effective manager in the digital age. Those key abilities include them having the skill of making speedy decisions in a changing environment, managing a disruptive environment, being responsive and communicative to their employees, managing connections and resurgence of technical skills. Moreover, Palmer, Dunford and Buchanan (2016) state that if a leader or manager themselves do not actively practice or use the technology that they are encouraging their employees to use, that could lead to resentment and a lack of effort. That said, in order for their employees to have faith and confidence in their leader, he must engage in the practical work itself (Palmer, Dunford & Buchanan, 2016). As Alvesson, Blom and Sveningsson (2017) explain, leaders refer to those individuals who engage in asymmetrical relationships and can have an impact on the meanings, values, understanding, and ideas of their subordinates. Thus, the importance of portraying meaning and understanding of why a new technology has been implemented is crucial. Hence, in order to limit the negative impacts that technological change may have on their employees and to promote resilience, flexibility, and general well-being, managers must provide the support and direction that is required (Trenerry et al. 2021).

2.3 Chapter Summary

The theoretical framework highlights organizational learning and its correlation to the performance of the company, the distinction and contradiction between sharing explicit and tacit knowledge with technology and the digital learning environment largely shaped by the continuous progress of technology. The aspect of competency mapping within organizations is presented alongside socio-technology. Additionally, the framework provides clarity on the concept of socio-technology, as a system used to align individuals and technology,

emphasizing on its role as a vital aspect of organizational learning, particularly in light of the emergence of new technologies. Importantly, it underscores the necessity of adapting to new technologies to ensure their effective utilization.

3. Methodology

The following section provides an outline of the methodology used for this research. This section starts with a discussion on the philosophical foundation, where we discuss the ontological and epistemological backgrounds that have guided the research, especially the interpretive tradition. Following that we will explain how we approached this research, where we followed an abductive approach, a qualitative research method as well as a single-case study. Next the discussion will continue onto the data collection process and we will explain how we conducted the sample for our research, explain how the interviews were conducted as well as describe how the interview guide was created, additionally explaining pilot testing. Following that, the data analysis process will be presented, covering the sorting, reducing, and arguing processes. Finally, we will consider reflexivity, ethical and credibility issues that were taken into consideration.

3.1 Philosophical Grounding

Berryman (2019) states that ontology and epistemology are philosophical assumptions that together define the researcher's worldview and shed light on what the researcher thinks to be the nature of truth, the nature of the world and the ways of existing in that world. Ontology on its own is the philosophical study of being and what we believe can exist (Berryman, 2019). We believe our research falls into the constructionist ontological position as we look at how social actors in this case our respondents view a phenomena, how they influence its meaning and take an active part in constructing it (Bryman & Bell, 2011). On the other hand, we need to take epistemological concerns into consideration as well and that is the study of how we know, how we know it and who possesses that knowledge (Berryman, 2019). Therefore, both ontological and epistemological assumptions influence how we generate our research, however we will delve even deeper into the interpretive tradition which we believe drives our research the most.

Thus, the goal of the research is to gather information on how the utilization of socio-technology supports organizational learning. We believe the interpretive tradition to be of relevance as the interpretivist researcher seeks explanation, knowledge and meaning by searching for various truths and the interplay between the knower and the known (Berryman, 2019). The interpretive tradition can be connected to what Weber (1947 cited in Bryman & Bell, 2011) calls sociology and that is the science of understanding human action and aiming

to arrive at a causal explanation. In this case, our study specifically calls for symbolic interactionism (SI) since it touches upon the topic of individual sense-making and the development of the individual (Prasad, 2015). Additionally, the role of the individual or identity can influence how that individual interprets and puts meaning on a situation or reality (Prasad, 2015). Thus, our interviews were heavily influenced by the SI tradition as our aim was to look into the topic of socio-technical systems and how they support organizational learning and discussing with individuals with the managerial role give great insight into how they interpret and experience this issue.

3.2 Research Approach

In this section we will discuss how we approach the research in an abductive manner. Following that we will give argumentation on why a qualitative research method was relevant in our case. Then, the explanation will be provided why a single-case study was conducted to address the research topic, enabling the exploration of multiple perspectives within a specific context involving various individuals.

3.2.1 Abductive Approach

As Bryman and Bell explain (2011), research can be either deductive or inductive. They state that a deductive theory means that the researcher creates a hypothesis or a research problem based on what is known about the phenomenon. On the other hand, an inductive theory is when the theory is the outcome of the research (Bryman & Bell, 2011). Because of the limitations with either of these approaches, there is a third approach that has become more popular and that method is called the abductive approach. According to Alvesson and Kärreman (2007) the abductive approach includes an interest in problematizing and revising prevailing notions and theories. This approach has three steps, the first step is investigating existing material or theory about a phenomenon, the next step is observing whether there is a gap in the literature or a surprising phenomenon in the theory and then constructing a new theory in light of the surprise that is found with the observation (Alvesson & Kärreman, 2007). This paper adopts an abductive method, where the construction of a theoretical framework serves as the basis for empirical findings. Subsequently, the collected data led to a review and refinement of the theoretical framework, incorporating new research and removing aspects that did not contribute significantly to the research. In addition, alongside the interpretation of the findings, it became evident that many of the technological systems utilized by StexCore aligned with the concept

of socio-technical systems. As a result, although the questions were primarily focused on gathering insights from a technological standpoint, the data provided material to establish a social-technical perspective.

3.2.2 Qualitative Research Method

A qualitative method was used for this research as it is appropriate when looking at certain topics in detail. Qualitative methods are useful when the objective is to analyze elements in people's lives in natural circumstances (Yin, 2011). Additionally, Rennstam and Wästerforst (2018) explain that qualitative research methods are useful when attempting to comprehend social phenomena or social contexts where the understanding cannot be achieved by the means of using numbers. With qualitative research the aim is to understand the meaning of things rather than to calculate how much or how many (Rennstam and Wästerforst, 2018). When doing qualitative research, the researcher establishes a gap or a problem in the literature and needs further investigation (Creswell, 2012). Ultimately, the researchers could broaden the understanding of a particular concept that they have found needs further investigation by placing them in new contexts (Rennstam & Wästerforst, 2018). That said, the researcher conducts a study in order to identify a trend in responses and further knowledge from participants which aims to explain the problem (Creswell, 2012). As a result, qualitative research allows researchers the opportunity to interact and engage with experts in a field that is of interest to them in order to better understand human behavior and try to characterize collective action. Therefore, in the aim of exploring how socio-technical systems are aligned with organizational learning and in addition investigate important factors facilitating their effective utilization, qualitative research is indispensable. Furthermore, considering the impact of individuals' perceptions and system development, there is additional impetus to incorporate quantitative methods in this study.

3.2.3 Single-Case Study

The research we conducted was in the form of a single-case study and that is when researchers do an analysis of a single situation in an in depth manner (Kumar, Leone, Aaker & Day, 2018). For emphasis, our single situation is that we are looking at how the utilization of socio-technology supports organizational learning and we discuss with multiple individuals in order to get a broader view on the topic. Moreover, doing a case study is relevant when the researchers are trying to find answers to descriptive questions such as; discuss what happened

or an explanatory one such as; how or why did this occur (Yin, 2012). Furthermore, Kumar et al. (2018) explain that a single-case study usually involves doing multiple in-depth and unstructured interviews with several different individuals. Discussing with several individuals and getting their views and experiences on a single situation gives a more cohesive picture of the phenomenon we are researching. Therefore, we decided to do multiple semi-structured interviews on an individual basis in order to give them the opportunity of expressing their own experiences and opinions.

3.3 Data Collection

As Styhre (2013) states, the data collection section should include all relevant information on the methods used to gather the empirical data. That includes what corporation was selected and why, how participants were selected and how the data was gathered (Styhre, 2013). Empirical material was gathered in the form of semi-structured interviews. The organization we used for this research has been given the fictitious name StexCore to preserve confidentiality. That said, we established contact with a manager within the global manufacturing corporation StexCore. Our material was collected by doing eleven interviews via Microsoft Teams, all with managers in the field of technology and learning within StexCore. Furthermore, in this section we will begin with presenting how we found participants for our research. Then we will discuss how our interviews were constructed and lastly, discuss our pilot study and how our interview guide was created.

3.3.1 Sampling Method

When selecting participants, purposive sampling was used. Purposive sampling is when researchers select participants according to their knowledge or expertise with the research topic (Yin, 2011). The aim with choosing participants in this manner is to gather as much relevant and rich data as possible (Yin, 2011). In the initial state of contacting the company used for this paper, we were given a supervisor that was to be our contact person throughout the process. This supervisor helped significantly and was gracious enough to take his valuable time finding participants for us. This supervisor created an Excel Sheet with relevant individuals that could bring valuable insights to our research and these ten individuals were all in the field of technology and learning. Furthermore, it is important to note that one participant invited another individual to participate as well and that could be a form of snowball sampling. Snowball sampling is a type of purposeful sampling and is when a respondent or a person that

is being interviewed recommends another individual that they deem as worth discussing with (Yin, 2011). Therefore, the final count of individuals that we interviewed was eleven. The following table lists the individuals that we interviewed and information about their background, how the interviews were conducted and the duration of each one.

Table 3.1 Overview of participants for the interviews

Participant	Gender	Job Title	Collection	Interview Time
Will	Male	Senior WCM Manager	Microsoft Teams	60 minutes
David	Male	WCM Coordinator	Microsoft Teams	54 minutes
Michael	Male	Smart Factory Programme Manager	Microsoft Teams	40 minutes
Olivia	Female	Learning Engagement Manager	Microsoft Teams	33 minutes
James	Male	Logistics Manager	Microsoft Teams	41 minutes
Jennifer	Female	WCM Engineer	Microsoft Teams	32 minutes
Sarah	Female	Digital Content Manager	Microsoft Teams	60 minutes
Peter	Male	WCM Manager	Microsoft Teams	30 minutes
Christopher	Male	Global WCM Manager	Microsoft Teams	41 minutes
Brian	Male	Factory Director	Microsoft Teams	39 minutes
Daniel	Male	WCM Manager	Microsoft Teams	39 minutes

3.3.2 Semi-Structured Interviews

According to Kvale (1996) the fundamental form of human interaction is a conversation. He states that a research interview is on the basis of conversing with an individual in both daily and professional life. He explains that an interview should have a purpose to it and a good structure. Therefore, we as interviewers had to have a good structure in place as we were the ones controlling the situation. As Kvale (1996) states, the researchers are responsible for introducing the topic to the interviewees and explaining its purpose. That said, we found that semi-structured interviews were the most appropriate as they are on an individual basis and are where the researcher strives to cover a range of specific topics in depth (Kumar et al. 2018). One-on-one interviews are where researchers interview one individual at a time and record their responses (Creswell, 2012). Therefore, in order to gain as much insight from the

interviews as possible, a question list was created consisting of open-ended questions. Open-ended questions are asked to create a space for the participants to best express their experiences, perceptions and views (Creswell, 2012). Ultimately, the aim with semi-structured interviews and open-ended questions is to let the participants express themselves freely without the researchers leading or directing them in predefined directions (Creswell, 2012). Despite our efforts to refrain from leading the interviewees in predefined directions, we asked follow-up questions and asked the individuals for further explanations when necessary. This was done in order to elicit as much useful information from the respondents as possible, as well as input on issues and topics that were highly interesting and could have the possibility of enhancing our research.

After conducting interviews with respondents provided by the supervisor, it was considered to request additional interviews. However, it was realized that the study had reached a state of saturation, indicating that further interviews would not yield new or diverse data (Creswell, 2012). After just having a few interviews, similar responses and patterns emerged, leading to the exclusion of answers during the coding process. This further supported the decision not to conduct more interviews.

3.3.3 Creation of Interview Guide & Pilot Testing

The interview questions were formulated with assistance from the theoretical framework, employing the headings as reference points. The headlines were used to create theme-like questions which then were accompanied by follow-up questions. The interview questions were designed to investigate the use of technology for learning, the learning environment, technological advancements and the implications of adopting new technology.

As mentioned earlier, the questions were constructed to be semi-structured and open-ended. A first question was constructed to ask the respondent to describe who they are, how long they have worked at the company and how their journey within the company has been. This was made to primarily get to know the respondent but also to make them more comfortable. Before the original interview guide and the actual interview used for this research were conducted, a pilot study was undertaken. A pilot study serves the purpose of giving an opportunity to practice and get to know the field of research before conducting the real data collection (Yin, 2011). The pilot study was created with a short interview guide consisting of approximately eight questions. The two respondents that were participating for the interviews were selected with the criteria that they work in similar settings and roles of the future desired respondents. The

pilot study gave us the opportunity to practice our interview skills, and see whether the questions were in the right scope and foremost what questions did not bring any valuable answers for the study. Yin (2011) also explains that the one prominent purpose of a pilot study is to motivate the authors and lead them in the right direction of studies, which we experienced.

3.4 Data Analysis

When interviews were concluded, they were transcribed from the recordings in order to begin the process of coding the answers and following that, put those codes into themes. This process provides the ability to sort and structure the answers and to understand single situations in detail further and eventually ease the process of analyzing the findings, as described by Creswell (2012). Sorting empirical material into themes creates order and structure, and spending time with the material enables researchers to find patterns and know what is relevant (Rennstam & Wästerforst, 2018). First we will discuss our sorting strategy and explain the process and the procedures. Following that we will explain how we reduced our material and discuss that our process included two methods and those were categorical reduction and illustrative reduction. Finally, we will explain how we argue for our empirical material using the excerpt-commentary unit model.

3.4.1 Sorting

Before analyzing the collection of data it is important to sort it (Rennstam & Wästerfors, 2018). Sorting according to Rennstam and Wästerfors (2018) is a method of trying to reduce the chaos that transcribed interviews may appear at first. By dividing the responses from the interviews based on the content gave the ability of trying to bring order to the gathered material. We read the transcribed interviews carefully and when we encounter recurring remarks from the respondents they were color coded into themes. Aforementioned, Rennstam and Wästerfors (2018) state that it is important to get familiar with the material and reading carefully through it is highly beneficial. They also explain that sorting material this way and taking the time to carefully diagnose it gives us the possibility of knowing what information is relevant and important which will make the analyzing process much easier and efficient. Moreover, when we were done with the initial theme analysis we read through each interview again to identify our sub-categories. The order in which we sorted our material can be connected to what Rennstam and Wästerfors (2018) explain as analytical induction. Analytical induction is where an explanation of a phenomenon is first introduced in a simple manner then gradually diving

into a more complicated or deeper explanation of the topic (Katz, 2001 cited in Rennstam & Wästerfors, 2018). It is important to mention that our initial themes and sub-themes changed over time when we got even more familiar with the material and the order in which we sorted them.

3.4.2 Reducing

Upon completing the initial sorting, it became apparent that our database had become excessively extensive. Consequently, we embarked on the task of reducing our material into a more manageable database. When reducing the material we could identify our methods both as categorical reduction and illustrative reduction. Categorical reduction is when researchers prioritize some themes above others in order to produce a more manageable and intriguing set of material to work with (Rennstam & Wästerforst, 2018). Consequently, Alvesson and Kärreman (2007 cited in Rennstam & Wästerforst, 2018) explain that one should choose their themes also based on what the researchers have examined in their theoretical background. When we were reducing our material we had the theoretical background as a guide not as the premise of confirming what previous research has stated but to see whether there are clashes and if our empirical material has a new way of contributing to those topics. Moreover, we could find similarities with our methods of reducing with the illustrative reduction principles. Illustrative reduction is where the researcher locates quotes that expressly point out a key process or characteristic in the selected category (Rennstam & Wästerforst, 2018). Reducing material this way is to identify similarities between the respondents' answers and note them key points. By highlighting those key incidents we could find the quote that illustrated that point in the best manner and use that in our empirical findings section. As a result, when we went through the collected data once again, we were generous with reducing our material and only included quotes that were relevant and perfectly encapsulated the subject.

3.4.3 Arguing

When sorting and the reducing process was finished, argumentation is another process that Rennstam and Wästerforst (2018) discuss as the next and important step. Furthermore, they state that theorizing can be seen as a form of argumentation. According to Swedberg (2012 cited in Rennstam & Wästerforst, 2018) creating a theory with your empirical material means that you have to argue for the significance of what you have found. The aim with argumentation is to clarify how the empirical findings connect to previous literature, if the researchers have

filled in a gap as well as how it deviates from it or adds that previous literature. As a result, the empirical evidence should have a key message that relates to the overall comprehension or explanation of the phenomena (Rennstam & Wästerforst, 2018). Furthermore, when we analyze our findings in the following section we use the excerpt-commentary unit model. The first stage of the model is explaining an analytical point and what we want to point out. Following that, we discuss the empirical excerpts that we are going to use and that is called an orientation. Then the empirical excerpt is introduced in the form of a quote from the respondents following with the analytical comment from the researchers themselves (Emerson et al. 1995, cited in Rennstam & Wästerforst, 2018). This way of arguing by using the excerpt-commentary unit model will be presented in the findings section of this paper.

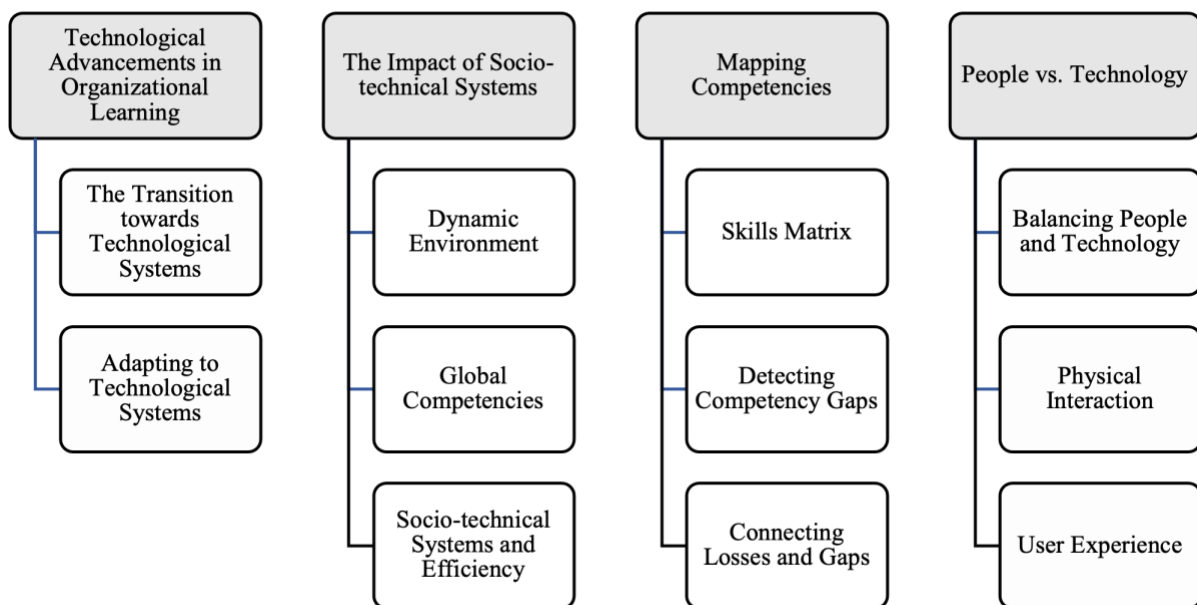


Figure 3.1 Overview of findings

3.5 Reflexivity, Ethical considerations and Credibility

We attempted to keep a reflexive mindset throughout our research process. As our research involves both ontological and epistemological assumptions we attempted to take reflexivity into consideration. Striving for reflexivity, Bryman and Bell (2011) explain that it is important that the researchers considered taking himself out of being the center of the narrative and enabling other voices to be heard. Therefore, as our research considered constructionist ontological positions where we look at how our respondents view an issue, how they interpret its meaning and how they could be co creators. Bryman and Bell (2011) explain that

deconstructive reflexivity means that the researcher challenges their own preconceived notions and acknowledge that there will always be various legitimate interpretations of the research topic. Furthermore, they mention that deconstructive reflexivity has its correlation with the interpretive epistemology, which is researching individuals behavior and meaning. Taking this into account, our research was influenced by the respondents. Their insights provided us with more interesting topics that we had not yet thought of or researched literature on. Being reflexive in this sense gave us the opportunity to deviate from our indented question list and ask follow-up questions that were relevant to our research topic. As mentioned previously, this process can be seen as an abductive approach.

During the process of writing, interviewing and processing this thesis several ethical aspects have been taken into consideration. Diener and Crandall (1978 cited in Bryman and Bell, 2011) discuss four ethical principles that researchers have to take into consideration since they directly affect the integrity of the work. These being, reduce any risk of harm, acquiring consent, no infringement of privacy and avoiding any deception (Diener & Crandall, 1978 cited in Bryman and Bell, 2011). Regarding the first principle, before the data collection process began, a Master thesis agreement was written up between ourselves and StexCore. This was done in order to provide protection to ourselves, our respondents as well as the organization. This contract was signed by us, the internal supervisor at StexCore and a third individual in Human Resources at StexCore. The agreement covered technical details such as data access, confidentiality, and legal aspects related to publishing the work. However, the purpose of the contract was not to restrict the research or impose limitations on the scope of the study. From the outset, it was clear that the thesis would take a collaborative approach, with both parties contributing to and benefiting from the research.

Next two ethical principles that Diener and Crandall (1978 cited in Bryman and Bell, 2011) state are critical to mention relate to each other significantly. Prior to commencing the interview, we sought the interviewees' permission to record the conversation to facilitate the transcription process, assuring them that the recordings would be deleted once the transcription was complete. The respondents were additionally asked whether we could use their name and job title which all of them agreed to. However, in order to provide the ultimate security for our respondents we decided later on to anonymize their names. By doing this, we could have limited the truthfulness of our material. As Alvesson (2011) points out, a manager could take great care with what he reveals and is open to discussing, even though one guarantees anonymity and caution, they cannot be certain on how the material will be used and in what

context. That said, as Bryman and Bell (2021) mention, researchers should give their respondents as much information on the topic of discussion in order for them to decide whether they would like to participate or not. We took care to avoid bringing up sensitive topics to further emphasize privacy issues. Moreover, we provided the transcribed interviews to the respondents for verification, ensuring that the responses were accurate and did not breach the confidentiality agreement. Additionally, the completed thesis was submitted to the internal supervisor at StexCore as an extra measure to safeguard against any inclusion of confidential information within the thesis. This precaution could also signify that the thesis is more trustworthy and credible, hence the empirical findings have been thoroughly examined by everyone involved.

Lastly, researchers need to consider whether there has been any deception on their part. (Diener & Crandall, 1978 cited in Bryman & Bell, 2011). Our aim was to conduct the interview with utmost respect for the respondent's views, ensuring that we maintained transparency and did not manipulate the responses to suit our interests, additionally providing credibility to the answers and data used in the thesis. After asking for permission from the respondents to record the interview, we gave them a brief description about us and the purpose of doing these interviews. Following that, we explained our meaning behind organizational learning and its usage regarding technology. Again, allowing our internal supervisor to review our completed work before submission underlines that we conducted our study honestly and for the intended purpose.

3.6 Chapter Summary

In this section we have explained how we position this research in the symbolic tradition, as we attempt to seek understanding and meaning from the respondents. Furthermore, we have utilized the abductive approach, and explained how the semi-structured interviews enabled us to gather insights into the topics in question as well as new topics that could benefit this research. This section has additionally, presented the analysis process of our material and lastly, shared the ethical considerations, credibility as well as how we have throughout the process strived for reflexivity.

4. Findings

In this section we present the findings of this research. The findings are based on eleven interviews, all with managers from StexCore. The aim of these interviews was to gather data in order to answer the research question: *How does the utilization of socio-technical systems align individuals and technology, fostering a conducive environment for organizational learning?* Answers from the interviews were coded and categorized into four main themes and those themes are Technological Advancements in Organizational Learning, The Impact of Socio-technical Systems, Mapping Competencies and People vs. Technology. Each theme consists of several sub-themes which will be presented later on in this section.

4.1 Technological Advancements in Organizational Learning

The first theme discusses how the technological advancement in organizational learning has transitioned and evolved over the years and what could have influenced that development. In addition, we will present the findings when discussing the adoption process to new technological systems, what entails in it being successful and insights into managing individuals displaying hesitations. The answers were categorized into two sub-themes: The Transition towards Technological Systems and Adapting to Technological Systems.

4.1.1 The Transition towards Technological Systems

When asked whether they have seen a change or development regarding organizational learning, David noted that prior to the development of digital learning materials, learning was more difficult, time-consuming and demanded significantly more effort. Furthermore, David discusses how learning was more hands-on and verbal with experts teaching you with minimal reliance on formal documentation to demonstrate the process. As a result, in earlier days there seemed to be little opportunity for self-learning. From that, David says that they started to document information, however those documents were very cumbersome to read. Therefore, to make this process easier Christopher explains that they started to transform these long documents into different media, for example short videos in order for the learning process to be shorter and more efficient.

"I had to go to libraries, I had to buy books offline and read those on my own, if I wanted to learn more. So, that was how we did it back in the early 90s. Then we started writing standard operating procedures, but they were long documents

with a lot of words, no media involved in that and so they were very cumbersome to read to learn but that was how we did it" (David)

Furthermore, when discussing what had influenced this transition, the respondents were unanimous in the view that Covid-19 had a great impact on how learning has transformed over recent years. Will notes that in order to grasp this change or transition to digital learning systems, we need to take the pandemic into consideration and says that before, training was more or less face-to-face training. Olivia mentioned a similar perspective and states that Covid-19 made it not possible to teach in person anymore and they were forced to adapt to digital solutions as they did not want this pandemic to hinder people's development in their learning. Furthermore, Brian points out that before Covid-19 the majority of training was done physically with hands-on training and e-learning was only around 10%. Additionally, Sarah explains that learning today is completely changed and they evaluate what needs to be changed continuously in order for people to learn faster and better. Therefore, because people could not be in person anymore as a result of the pandemic, they had to transition to digital solutions and learning changed to 100% e-learning and virtual libraries and video training became much more common, which they still use to this day.

"And I can say like this when the pandemic started learning face to face was not anymore possible. But we didn't want to stop the development of our people. That's why we transferred our programs into either virtual session or something digital" (Olivia)

Olivia explains that this transition is happening at a rapid pace and it is important to be vigilant and these technological learning solutions will become even more prevalent in the future. David also says that this evolution has made learning in organizations become more of a self-learning culture and taking ownership of our own development. He explains that this taking ownership of one's own development is something that will be more prevalent in society in the future. That lines up with what Christopher discusses and that is how they are moving to a more autonomous way of working. He asserts that this development is also on how we change how people behave, and that it is crucial now in order to not have to rely on someone always being there to train you.

"And then the other development is actually the people side, how to change the behaviors because of course we are trying to go towards a more autonomous

way of working where you're not so much relying on that someone else is available to show you someone else is available to train you" (Christopher)

David discusses how transitioning training and learning to digital means has made the training process much easier and better. He explains that this gave them the opportunity to understand it better and gave them a good methodology to follow. This methodology made it possible for them to assess and set skills for right individuals, create training material for the right individuals and for their specific roles. Therefore, the training was made specifically for the right people and for the skills that they need.

"Then we started [...] which helped us to understand our education and training process much better. It gives us a methodology around assessing skills, setting skills, setting training that that should go with certain roles and then we started developing those trainings" (David)

4.1.2 Adapting to Technological Systems

In addition to being questioned on the change and development of learning in their organization, the respondents were asked to explain how they ensure that the adoption process to new technology or systems is successful, and how they manage individuals that could display hesitations.

One of the most prominent answers for making the adoption process successful was to make sure that the employees knew the purpose for the change or implementation of the new system or tool. Christopher emphasized on not using "fluffy corporate language" and described the abbreviation WIIFM - Whats In it For Me, and how that is important to fully communicate in order to understand and apprehend the transition. David also stated that besides clearly explaining the purpose, there needs to be a value explained for the individual person, which correlates with Christopher's statement of description of WIIFM. Peter and Jennifer share similar views and explain that if a person knows how it benefits them, they will learn and adapt easier. Christopher and Michael emphasize the significance of clarifying the purpose of change, particularly in situations where the existing methods are working fine. Michael also highlights that individuals tend to have a strong attachment to their own solutions and that motivating and persuading those who do not conform to the standard protocol can be challenging.

Another aspect of making sure that the adoption process is successful is managing and working with employees' attitudes. Sarah states that one of the biggest issues today is that people still believe that face-to-face learning is better than digital learning and therefore, it is important to work with people's mindset so that this change process is not as daunting. Olivia further emphasizes that point by stating that people are generally afraid of change and the unknown. Which consequently highlights James' point that attitude towards change or adapting to new things is a key component in making sure that the learning process provides the desired outcome.

"So the attitude is also critical because you can have the knowledge, you can have the training, but if you don't have the correct behavior in the attitude to perform the activity that you need to do. Well then you will not have the desired outcome" (James)

Additionally, Jennifer states that it is important to understand people's negative attitude towards digital solutions as it can reflect on why the learning was unsatisfactory. She explains that perhaps the employees had different expectations or there was a lack of time or resources which resulted in this negative attitude. When you understand the underlying reason for the negative attitude, then you can prevent and avoid future misconceptions about the learning session. Christopher and Peter also touch upon the topic of working with behavioral change with employees. New technology creates new ways of working and therefore it is important to also make the people work accordingly. In addition, James further explained that besides the new technologies existing, it is also important to make sure that people are aware of the technology and how it benefits the individual.

Furthermore, Sarah and Christopher explain that some people actually prefer doing things virtually than in person. Sarah states that this attitude has been prevalent especially after Covid-19 and at first people found it difficult to only do virtual learning sessions or meetings online. Then after two years that some people actually prefer it now, and she gives the example of how in a big company such as StexCore, the premises are quite large. Therefore, if they have a face-to-face meeting one person could have to walk up to 15 minutes to get there, and she explains that it would be much easier to just have the session online.

"First six months after Covid started, it was difficult. And everyone, not only me, but many employees were complaining that it's boring to work from home.

We don't see each other after one year it became comfortable and after two years nobody wants to be back to the office. We might be on site on premises, but it's a huge company. You need to walk between buildings and it might take up to 15 minutes to walk outdoors between buildings during the rain. Do I want to do that to meet physically or I can just call you and we can have a conversation and that's it" (Sarah)

When asked about what they recognize as challenging when it comes to the adaptation of technological systems for organizational learning, respondents discussed how generations can respond differently to those new technologies. According to James, it can be challenging to collaborate with individuals from various generations in the production floor, and the older generations could have more experience and be accustomed to, and may even favor traditional methods of learning. Furthermore, James states that the younger generation are more used to learning digitally and therefore, can be more open to it. However, Will makes a point of explaining that older generations can be very open to new technical learning solutions as well even though there can be instances where they are not.

"Because if you go for older people, most likely they will prefer more traditional ways of learning and teaching and documenting the work instructions. If you're younger, most likely they will like more digital tools" (James)

Ultimately, transitioning to a more digital way of learning is a continuous process and Will, Michael and James are unanimous in the view that generations can have differing views on whether that is the best learning or training method. Michael explains that to him it is much easier to work with a computer or a tablet than with for example paper and pen and this attitude will be more prevalent in the future when the younger generations come into the workforce. Peter shares his point of view and states that when the older generations leave the work-environment, the digital learning solutions will be better received and easier to adapt to.

"I believe in the future that it will help us and mainly when the people change and the older people are leaving the company and the new people enter I think it will start to work, I think it will help in the future" (Peter)

Lastly, mentioned by several respondents, in order for people to be excited and embrace new technology, it is important to have great guidance and trust from the individuals that are teaching you. Christopher even states that there needs to be trust for the technology and that

people need to believe that it will benefit them. James mentioned that as an instructor, the introduction of the new technology is vital for how it will be perceived, adapted and whether it will ultimately be accepted. David additionally, shares a similar view and explains how it is important to promote the new technology and make the employees excited for it. Jennifer further explained that as the instructor, it is important to guide and support the employees to avoid frustration and therefore also ensure a successful adoption and implementation.

4.2 The Impact of Socio-technical Systems

In order to gain insights into the role of socio-technical systems in organizational learning, the respondents were asked to explain the effects of technology on their environment and its contributions to organizational learning within their organization. The answers were categorized into three sub-themes: Dynamic Environment, Global Competencies and Socio-technical Systems and Efficiency. Although socio-technical systems have a broad impact on various aspects of the organization, these sub-themes represent areas where the impact has been particularly significant.

4.2.1 Dynamic Environment

When asked to discuss how socio-technical systems impacted the learning environment several respondents described it to be dynamic since there is an extensive amount of information and knowledge available to them, as well as a wide combination of different tools, technologies and channels where the knowledge is obtained and shared. Christopher additionally mentioned that the organization employs a lot of experienced individuals and with the use of technology, information is more available for other employees to benefit from and have greater possibilities to learn and acquire more knowledge. At the same time as knowledge becomes more available with technology, in order for employees to truly use and benefit from the information, it is crucial that they are familiar with how to use the various tools and systems. Christopher express it as;

"Dynamic is something I would say because there is a lot of information available. This is a fantastic thing with StexCore. The information is there. It's more about finding it in an easier way and being able to absorb it based on how it was developed" (Christopher)

Olivia also explains that a big part of her role is the engagement of employees, so that they know where to find necessary learning and content. Michael further explains that he sees great opportunities to transfer even more learning and training to digital and virtual places, and that it is determined by how well the equipment and systems work. Olivia shares the same view of the potential of moving towards using more digital training by saying "If this session is designed in the right way, and if the focus of learners are there, present the right focus. It can bring the same value as the face to face". Consequently, also emphasizing on the significance of the design of the digital or virtual place. James further explains that having learning materials in a video format is a great middle ground for the learning environment, as it takes into consideration things such as tone and expression which a written document does not convey.

A few of the respondents revealed that despite the widespread use of technology for learning purposes, they still rely on traditional methods such as pen and paper for documenting and taking notes. Additionally, they emphasized that certain types of training require a physical approach, as the work itself is physical in nature. However, they pointed out that physical learning can be combined with technological learning, which will be further elaborated when we discuss the 10-20-70 method in the theme People vs. Technology. David and Brian expressed concerns with the use of digital systems, citing difficulties in navigation and selection. Brian added that without physical interaction, it is difficult to assess whether the knowledge has truly been absorbed and retained by the employee. These observations highlight the importance of striking a balance between traditional and technological learning methods, as well as the need for user-friendly digital systems and opportunities for physical interaction in the learning process.

As previously mentioned, the use of technology for learning has facilitated the process of sharing knowledge. This exchange and sharing of information is not limited to individuals but has expanded to entire factories and countries, allowing for a broader scope of knowledge sharing. Moreover, Michael explains that using technological systems for learning and creating instructions enables workers to share their experiences and solutions, especially beneficial when an issue arises. He states that technology enables them to learn from others around the world who have similar jobs and perhaps have encountered the same problem. This has proven to be highly beneficial as it not only saves time but also improves overall efficiency and productivity. Additionally, it is not enough for knowledge to exist; it also needs to be transferable in order to be useful to others. James recognizes the significance of converting tacit knowledge possessed by employees into explicit knowledge to enable sharing and

utilization by other colleagues. Failure to document and make knowledge explicit leaves the organization dependent on individuals and unable to disseminate the knowledge widely.

"[...] there is also a function where you can reach out to your peers around the world very easily. So hey guys, I have this problem, how can I solve it? It goes out to the people with the same job and they can say, hey we are doing it like this and then you can look at that instruction and learn from that as well"
(Michael)

One key factor that enables the knowledge sharing, especially between factories in different countries, is the ability to automatically translate training content using these new systems. Several respondents explain that language is a great obstacle in a multinational company. The possibility of translation is especially important for the blue collar employees as they are not required to know English. Michael conveys that this was earlier not possible when using old systems, as it lacked the feature of automatically translating the content. Christopher and Sarah explain that in order to be able to use this assistance, the content that is in video format is instructed to be created without anyone speaking and instead use generated speech. This development in language translation technology has enabled organizations to seamlessly share knowledge and information across geographical and linguistic barriers. The feature of content translation for knowledge sharing is closely tied to the crucial step of making knowledge explicit.

"So if someone is working on a printing machine and someone is asking a question, immediately all the guys on the printing machine, we'll see the same question. And even with one click it will be translated to your language" (Will)

4.2.2 Global Competencies

Additionally, global competencies were brought into the discussion when exploring how socio-technical systems influence organizational learning. The respondents mentioned that global competences play an essential role in ensuring that machinery and equipment are operated efficiently and safely across all the factories in a multinational company. As explained by David, the company uses a system that links documents to globally assigned competencies for their equipment. This allows to set global competencies that are required to operate the machines, defined by the global groups who designed the equipment in Sweden. The use of this

system also enables the development of standard operating procedures and checklists based on global best practices. Operators can then access the system linked to the global competence library, ensuring that the same competencies are applied consistently across all factories. However, as Christopher explains, achieving this level of standardization requires a lot of effort, particularly in terms of developing and translating training materials to different languages.

"Using that we developed standard operating procedures and the checklist, everything that I talked about based in a way that it is global best practices are used. The operators then can use the system linked to the global competence library" (David)

Before the implementation of digital tools, standardization was challenging, as Christopher points out. With different training materials stored on various servers, standardizing processes across factories was almost impossible. But now, digital systems allow for the leverage and spread of knowledge across factories, enabling interaction and collaboration among them. Overall, global competencies and digital tools are crucial components in ensuring that factories operate at optimal efficiency and safety levels while providing a platform for continuous improvement and learning opportunities.

4.2.3 Socio-technical Systems and Efficiency

In line with previous discussion, we asked the respondents whether they have seen socio-technical systems to be more efficient when it comes to learning than physical methods. A majority of the respondents mediated a preference of using digital tools and technology for learning and provided great examples of situations where processes and situations were completed more efficiently. Christopher, Olivia and Sarah explained the concept of not having to move around as much, you don't have to travel or even walk to a certain conference room in order to access the learning session or material. Sarah further explained that a digital approach to learning is also cost-efficient.

"It costs less because it can be on demand, you don't need to clean up your schedule and being available, being on site, you don't need to travel. It saves time, it saves money, it's more efficient" (Sarah)

Will noted that digital systems facilitate efficient sharing of knowledge, feedback, and interaction with learning material. Similarly, Olivia emphasized the advantages of creating

digital learning materials, which can be easily and efficiently shared across a large, multinational company. As previously mentioned, a significant factor that enables the learning process to be efficient is the feature of the technology being able to automatically translate training material and documentations. The ease of sharing digital materials not only saves time but also promotes consistency and coherence in learning across different regions and teams. Both Will and Olivia's perspectives highlight how technology is increasingly becoming an essential tool for effective organizational learning. While a majority of the respondents expressed a preference for using digital tools and technology for learning, there were some who offered a different perspective. In fact, some respondents highlighted that it may not yet be fully efficient. Christopher, for instance, mentioned that while it is on the path to becoming efficient, it takes time to adjust to these changes and see their value. He noted that it is normal to face initial hurdles when introducing new digital systems, and it is important to keep in mind that long-term efficiency is the ultimate goal.

"Long term, we still see productivity improvement and we are becoming more efficient. But I wouldn't say that we are there yet. That will take some time before we get over this hurdle" (Christopher)

One of the challenges with using technology for the learning process is that its efficiency is difficult to measure and validate. Brian sheds light on this aspect by pointing out that while digital systems are effective for managing knowledge, they still lack the capability to demonstrate that the acquired knowledge is sufficient or efficient for practical, everyday tasks. This highlights the need for further advancements in the technology to better measure its impact on learning efficiency. Furthermore, the earlier claims about technology's positive effect on learning efficiency were not thoroughly analyzed or proven. Rather, they were influenced by common knowledge and anecdotal experiences. This raises concerns about the validity of such claims and emphasizes the need for proper research and analysis to back them up. Michael also raises an important point regarding the lack of a definitive answer or clear metrics to determine whether technology truly makes the learning process more efficient. This presents a significant challenge and an opportunity for further development and innovation in the field of technology for learning.

"If you're asking for a good answer or number, how much has it increased, I think that's a bit harder to say, but at least what we see there. Comparing that to previous Excel files with written instructions, not the video format and so on, I

think that we have a much, much better tool in place now. But I have no number on how much the learning has actually improved." (Michael)

Furthermore, another issue that arose when discussing whether technological systems are efficient for organizational learning. Peter says that they are working for these digital learning systems more than they are working for them. Therefore, he says that it can be time consuming to keep feeding the system information and creating content for it. Furthermore, Brian explains that today it can be difficult to allocate time for employees to learn. He says that before there was allocated time for many people at a time to learn and because of these digital learning solutions it is hard for people to find the time to sit down and watch training materials.

"I think today we have the tools ready. One issue for the factory is still time because the people need time to watch videos to learn. But in the past it was the same, the difference is we stopped the machine, took 20 people, booked the room and applied the training. Today, maybe you can just take one person by time. It's still an issue for the factories, mainly that it's not easy to take time to provide them the time to watch videos and trainings" (Brian)

4.3 Mapping Competencies

The respondents were asked to explain how their organization ensured that the employees are equipped with the necessary skills and knowledge for their role and how they address possible gaps. The aim of these questions is to ascertain the approach of the organization towards organizational learning and how they ensure the provision of learning where it is required, with the use of technology. The answers were used to create three sub-themes: Skill matrix, Detecting Competency gaps and Connecting losses and gaps.

4.3.1 Skill Matrix

The organization utilizes a feature within a digital system that allows for the mapping of each employee's knowledge and skills in a skill matrix. This matrix links various job roles to multiple skills, indicating the level of proficiency of each employee in a particular skill and the level they are expected to achieve. There are 4 levels of skills. Level 1 indicates that an employee has no knowledge or understanding of the particular skill. Level 2 is achieved when an employee has gained some theoretical knowledge about the skill, while Level 3 indicates that the person has demonstrated the ability to competently handle the skill. Finally, Level 4 is

attained when an employee can not only use their knowledge to solve problems, but also be a trainer in the subject matter. Will explained how the company is working with targeted levels and ideal levels within the system. He explains that the organization started creating skill matrixes as they identified more and more competencies and skills. Christopher and Jennifer explain that earlier the skill matrix was made from Excel files before it became more digitized. The skill matrix in the new, more digital, system enables the skills and competencies to be easier found, shared and detected.

"We tried to work from the beginning with this skill gap. Because when we establish different skill levels, people also try to have a target skill level and even an ideal skill level [...] what is your final vision, what is your final goal" (Will)

Christopher notes that while data can be captured on who knows what and how much, the real challenge is in analyzing the data to determine where to focus training efforts. This suggests that the skill matrix is used not only for identifying training needs but also for ensuring that all employees receive the necessary training. A skill matrix allows for a more detailed assessment of employee skills and competencies, and helps to ensure that training efforts are targeted and effective, and foremost that possible skill-gaps or competency gaps are detected.

4.3.2 Detecting Competency Gaps

Several respondents explain that the skill matrix is a powerful tool for identifying skill gaps and competency gaps, particularly among blue-collar workers on the shop floor. The organization is continually working to detect and address these gaps using a variety of approaches. In other words, identifying gaps and discrepancies of knowledge within the organization requires a proactive and continuous effort. In addition to allowing managers to identify training needs, the skill matrix also enables employees to receive reminders to review their knowledge or training materials. According to Sarah, this feature helps ensure that employees stay up to date with the latest information and can perform their job tasks with confidence.

The skill matrix and knowledge gap detection system is primarily implemented for the blue-collar population in the organization, as previously stated. However, Michael notes that the same system is still in the developmental phase for detecting gaps with the white-collar population. He explains that there is a wider gap in the skill level of white-collar employees,

and the organization is still in the process of implementing the same system and skill matrix to detect gaps for these employees. Although the skill matrix is perceived as a useful tool to identify gaps, it has not been fully utilized across the organization, despite its potential benefits according to the responses received.

4.3.3 Connecting Losses and Gaps

The implementation of a skill matrix and the identification of gaps in knowledge among employees serve a crucial purpose in the organizations. One of the key objectives is to determine if any losses incurred by the company can be attributed to the lack of skills or knowledge of its workforce. By analyzing the skill matrix and identifying gaps, the organization can take proactive measures to address any shortcomings in employee training. This, in turn, can significantly reduce losses and enhance the overall productivity of the organization. Michael explains it as follows "We are seeing who is actually trained on what, then we can actually begin to link that as well with the losses that we have out in our factories". Will, additionally explains the work with connecting losses and gaps as a way of being proactive and preventive. Ensuring that employees have the appropriate level of training and knowledge is a proactive approach to prevent losses from occurring in the first place. By equipping employees with the necessary skills, they are better prepared to perform their duties and are less likely to make mistakes that could result in financial losses for the company. This approach helps the organization to mitigate risks and improve overall operational efficiency. In conclusion, the skill matrix serves as a valuable tool to map out the competencies of employees and identify any potential knowledge or skill gaps. This information can then be leveraged to minimize losses by ensuring that employees are equipped with the necessary skills to perform their roles effectively. Identifying and addressing these gaps is crucial in ensuring optimal productivity within the company. By implementing this proactive approach, the organization can stay ahead of the curve and maximize its potential for success.

4.4 People vs. Technology

In this final findings section we will discuss what the respondents mentioned when they were asked to describe their stance towards how to balance technology with physical interaction. Additionally, they were asked to consider whether any learning activities were best carried out physically rather than via technology. As socially interactive systems align people with technology, it is crucial to explore the balance of this relationship and examine scenarios where

physical and digital proximity cannot be aligned. This theme is categorized into the sub-themes: Balancing People and Technology, Physical Interaction, and User Experience.

4.4.1 Balancing People and Technology

Several respondents mentioned how learning will be the most efficient if technology is there to support people instead of trying to replace them. Christopher makes that point exactly and states that they do not implement technology with the aim of replacing people and that it is created in order to support them. Peter explains that there is the need to find ways to combine both technology and people. He notes that technology should be used to aid people in learning and we need to survive with it because people need human interactions and communication. Furthermore, Jennifer brings out an important point, that technology can be better used to collect information and register data and people are more beneficial in creating processes, describing how to do something or how to work. She says the data that this technology collects and registers can be analyzed superficially by the technology and when it comes to a deeper analysis the people are the ones to do it. Furthermore, she mentioned that even though the technology is advanced people still need to be available to maintain the technology and look for improvements and how it can be further developed.

"For me technology should not replace people. That's an important stance. So we don't implement technology with the purpose of replacing people. It should be to support people" (Christopher)

The first viewpoint on balancing people and technology therefore emphasizes the significance of the technologies' purpose, that it is not used to replace people, but rather support. However, regardless of the intended purpose, the actual outcome could be different. David believes that having a combination of teaching methods is the most beneficial. Having those hands-on interactions and him as a teacher giving instructions and interacting with them. He explains the importance of making training exciting for people and for him as the trainer to motivate them. Daniel also discusses that human beings need society and with technology the relations can become cold and distant and that is something that we need to avoid or find a solution towards. Furthermore, Peter believes that face-to-face interaction and learning by doing is more efficient when it comes to learning however, the technology can help. Even though his viewpoint is that face-to-face learning is more efficient, he states that it is more time consuming.

"I just I'm not sure that we will ever be able to just use technologies to train human beings I just I just don't think we can. There needs to be some excitement, some motivation for them to learn, and me as a facilitator speaking with them"
(David)

These statements provide insights of the importance of the physical interaction when learning, but at the same time convey that technology can be beneficial and useful. Therefore, Brian and Sarah state that it could be important to identify what needs to be covered using technology and what needs to be face-to face. Sarah says a hybrid way of teaching can be difficult and if a meeting or a training session is online it should be online for everyone. There can be challenges when trying to make the training sessions hybrid. However, she believes that online training sessions work well and it can work well if it is then online for everyone.

"Another other problem that we have faced, but mainly with meetings, not such with learning, is a hybrid way of meetings because some people are back to the office as some people are still working remotely. And when we're getting workshops, training sessions we tell everyone it's digital for everyone. If it's digital it's digital if it's face to face it's face to face. So there are some limitations, but it works well" (Sarah)

Christopher, Daniel, James, Sarah, and Will provided insights into a popular learning method employed within the organization known as the 10-20-70 method. This approach is characterized by a combination of theoretical knowledge (10%), knowledge gained from a colleague (20%), and practical execution (70%). According to the respondents, the 10% theoretical knowledge can be self-taught using various digital systems. However, the remaining 20% and 70% require physical interaction and training. The practical execution of knowledge is a critical component of the 10-20-70 method, emphasizing the importance of hands-on experience and application in the learning process.

"Also we are following model 70/20/10 in learning. So 70% learning is happening at work, during your work it's your experience. 20% is learning from your colleagues by sharing knowledge with each other and only 10% it's actually the self placed or mandatory training" (Sarah)

The 10-20-70 method serves as an excellent illustration of how the learning environment is a combination of both digital and physical mediums. It also acknowledges that certain aspects of

training and knowledge sharing cannot be accomplished solely through digital means, further emphasizing on the importance of balancing people and technology. The method emphasizes the importance of physical interaction and hands-on training in teaching employees on the shop floors. It is worth noting that the 70% in this method represents the majority of the training, implying that most of the learning process on the shop floor takes place through physical training.

4.4.2 Physical Interaction

One point that is important to mention and what Peter stated is that it depends on departments whether some things can be taught physically or digitally. He explains that the packaging material process is designed for operators with physical proximity and learn how to work it hands-on. Furthermore, David discusses quality and safety assessments and explains that human eyes will always be vital to have. Following that, Jennifer mentioned the importance of networking and the human interaction of learning from others. She explains that it will always be important to learn how to do something physically from others by interacting and talking to each other.

"We have to have eyes to compare quality, we have to have eyes to recognize safety risk, we have to have humans to teach other humans you know with the hands on" (David)

Further aspect of human interaction is the creation of soft-skills and Jennifer explains how important networking is for people. She explains that it is highly important not to eliminate how people gain soft skills by networking. She gives examples of how important it is to talk to each other during breaks, share advice and know-how and especially with people who have extensive experience. Christopher shares Jennifer's views and states that meeting online or teaching online doesn't have as much of an impact than meeting physically. He emphasizes on the importance of group dynamics and building a team culture for people to obtain those soft skills. Olivia also says that it takes longer to build relationships with people online than with physical meetings and that this team building part cannot be the same. Building a strong relationship Will explains happens when you go and meet with the people and that there can become a barrier between people when they only meet digitally.

"But also when we talk about group dynamics, you know, we talk more about the soft skills of people. You know, building a team culture, those types of

things. You can do some parts online, yes, but we'll see a big difference when we meet physically" (Christopher)

Networking and soft skills can be considered as catalysts for learning, as they promote preventive measures to ensure a successful learning experience. However, one respondent shares her views and experience and explains that she worked on a project with someone for 5 years without face-to-face interaction and they managed to work together fine. Her view is that human interaction in real life is not essential when trying to accomplish or finish a project with someone.

"I worked with one IT project manager on five projects and I have not seen him for five years [...] We managed to complete the project so that interaction face to face is not so necessary. It is possible to deliver work without that" (Sarah)

This statement differs from the opinions of other respondents, as it presents a viewpoint that physical interaction is not necessary for effective collaboration. However, this statement is made within the context of collaborative work and not explicitly in a learning environment, which somewhat reduces its relevance to the significance of physical interaction in learning. It also does not account for the possibility that the collaboration could have been more effective with physical interaction, but rather highlights that it was not essential for task completion.

4.4.3 User Experience

For technology to support people the technology should be very user-friendly. Christopher describes how learning in short-video format is a good method as it becomes more absorbable for the individual and makes it easier to understand if it is visual. Another point several respondents made was to make the training material relevant for the individual and easily accessible. Michael explains that they make an effort to create the material for the end users so it is as relevant as possible for them. Furthermore, if the technology is too complicated or hard to learn the people will not use it. Olivia and James also make a point that a carefully designed training material and relevant information based on the learning need is important when training and getting the people involved as well.

"So defining what is the correct level of information and details that you need to provide to your audience when you're training, then when you're getting them involved it's very important" (James)

The format of both the system and content within the system plays an important role in how well technology is implemented and used by the employees. If the technology is not designed with the user in mind, it may not be utilized to its fullest potential and fail to serve its intended purpose. Brian and David however, mention that using technology to learn can easily distract you from your work. David explains that training virtually made him lose focus on the objective as he could get a phone call during a session or something else popped up on his screen. He values face-to-face teaching as then his focus is solely on the objective at hand. Brian shares this view and states that people need interactions and it can become dull to just sit and watch for example a 30 minute video and then after 10 minutes the focus is gone.

"I need people, I need to see people. Watching videos for 20 minutes, 30 minutes, after 10 minutes I cannot learn more. That's my opinion for my side because it's too boring, you know. It's just just learning list and list and list after 10 minutes, it's enough. I need to drink water, take a coffee and return 10 minutes later" (Brian)

This observation presents evidence that technology can result in a less satisfactory experience, especially in circumstances where maintaining focus and motivation is difficult compared to in-person training, which is suggested to foster learning differently and perhaps more effectively. Nonetheless, the perspective shared by Brian and David could also be interpreted as a challenge of adaptation, as they may not be accustomed to working in digital media.

4.5 Chapter Summary

In this section, we have presented and organized the findings from the interviews into four key categories. The findings demonstrate the respondents' perspectives on technological advancements and the utilization of socio-technical systems in organizational learning. This includes insights on competency mapping within the company. The respondents further discuss the challenges and emphasize the importance of adapting to new technology while maintaining a balance between people and technology. Lastly, an interesting contradiction emerges in the findings, as some instances indicate that technology does not facilitate learning and that physical proximity remains indispensable.

5. Discussion

The empirical findings of this research revealed that there are various factors that support learning by using digital learning systems. The findings show that utilizing social-technologies for learning has numerous benefits as well as challenges. Moreover, we discuss the development of learning technologies and how the respondents explain the adoption process. Next, we discuss the socio-technical components and the importance of balancing people and technology. This section, furthermore, highlights how competence is mapped out and detected and role of socio-technical components for organizational learning with technology. Hence, in this section we will shed light on the findings and put them in context with previous research that has been presented in the theoretical framework.

5.1 Organizational Learning with Socio-technology

Organizational learning is the overall theme of this thesis, thus understanding how it exists together with technology is essential in order to comprehend what technology in actuality contributes with and where it serves its purpose. Hislop, Bosua and Helms (2018) and Jonsson (2015) provide an understanding of the concept of *organizational learning*, being the collective individual and group knowledge in organizational structures. The level of organizational learning within a company is connected to its performance (Škerlavaj, Dimovski, Mrvar & Pahor, 2010; Argote & Hora, 2016; Stein & Vandenbosch, 1996). An evident challenge presented in the findings section is how the knowledge is united for a global company.

David and Christopher, explain their work with easing the process of collaborating and sharing knowledge, including creating *Global competencies*, as they serve the purpose of ensuring collaborative work and as a result equipment is operated efficiently and safely. Global competency can be argued to be a component within socio-technical systems used for organizational learning. Several respondents express the work environment to be dynamic, hence there is a lot of knowledge to engage in, however, the challenge is foremost to navigate the different platforms and sources. Christopher and David also state that the use of technology facilitates the process of standardizing operating procedures and that those are created with the help of *global best best practices*. David further explains that the use of technology facilitates people to more easily take part of and share global best practices, thus implementing with more efficiency and as a result better unifying the knowledge around the company. In other words,

technology facilitates the interactive and social aspect in the organization and additionally fostering organizational learning. Giannakos, Mikalef and Pappas (2019) explanation of technology being able to enhance the knowledge flow is supported by the empirical findings.

In addition, Christopher also states that technology enables the knowledge to be stored more efficiently, thus making it easier for people to find. In earlier days, a great challenge was to navigate the different systems and channels and therefore even finding global best practices. In addition, Will shares the perspective on how technology also enables the process of easier sharing feedback to the shared material, thus further developing the best practice. The presented benefits of embedding technology in organizational learning is shared with Ruel, Rowlands and Njoku (2021) viewpoint that organizational learning implies acquiring new knowledge, developing and refining said knowledge and sharing their ideas.

However, one notable feature of technology used for organizational learning is its ability to enhance the efficiency of the learning process across multiple dimensions. Mediated by Christopher, Olivia and Sarah, the advantage of using technology and digital tools for learning decreases the need to meet physically, thus saving both time and money as well as facilitating consistency and coherence across different regions. Socio-technology can therefore be argued to be a substitute for physical interaction. Giannakos, Mikalef and Pappas (2019) share similar views and say that technology enhances the knowledge flow in an organization. Furthermore, when discussing the flow of information within the organization, several respondents explained the learning environment to be dynamic. They clarify that by utilizing technology, they are able to increase the accessibility of professional knowledge for other people to learn from. As Škerlavaj et al. (2010) explains, both the utilization of past information and participation in communicative actions may lead to learning. In addition, they mention that *learning networks* foster a great learning environment and therefore, a better performing company as they are using existing knowledge and passing it along the chain (Škerlavaj et al. 2010). Therefore, the findings illustrate that it can be advantageous to use technology to share knowledge since it allows people to teach others rather than relying just on the knowledge solely existing. However, we emphasize the word *can* since there are instances where we found contradictions and we will discuss them further in this section.

Moreover, one feature to take into consideration for the possibility of having digital learning is the mode of knowledge. Hislop, Bosua and Helms (2018) explain that with Information technology, employees can capture and share their knowledge, hence turning it into explicit

knowledge. As tacit knowledge is subjective and influenced by individual interpretations, it is harder to communicate these with the use of technology (Panahi, Watson & Partridge, 2013). Tacit knowledge is better shared physically, and explicit knowledge is better shared digitally. However, Basten and Haamann (2018) explain that the technology does have the possibility to substitute physical interaction and create a virtual world where tacit knowledge easier can be shared and communicated, thus contradicting Will, Christopher and Olivia's statements regarding that soft-skills and relations is harder to create over digital channels. Panahi, Watson and Partridge (2013) additionally explain that technology provides several benefits for sharing tacit knowledge such as accessibility and triggering the social and informal communication. On the other hand, Basten and Haamann's (2018) explanation of sharing tacit knowledge being possible, does not convey it being easy to implement or being more efficient than face-to-face interactions. The contradicting insight of sharing tacit and explicit knowledge over digital channels, can therefore be argued to be an opportunity for development of these systems. Socio-technology can facilitate sharing tacit knowledge in some instances. The sharing of tacit knowledge is perhaps not suitable for the current stage of today's technology. In the current scenario organizational learning through socio-technical systems may be best suited for combination and internalization, as it is sourced as an explicit knowledge (Nonaka, Toyama & Konno, 2000). However, according to Panahi, Watson and Partridges (2013) explanation of possible benefits that technology enables for sharing tacit knowledge, also facilitates externalization and socialisations. Regardless, it can be argued that if knowledge can be coded into explicit knowledge, it is best suited for being shared with technology.

Another prominent finding is how the technology is used coherently with the feature of translating the learning materials. Will described that earlier, a big challenge was sharing and communicating e.g. best practices and different solutions due to it being written in different languages and was not automatically translated. In line with this, Panahi, Watson and Partridge (2013) explain that technology can be used to overcome possible language barriers. This can also be compared to Eriksson et al.'s (2000) statement of global companies promoting people's ability to better absorb knowledge, with the prerequisite that it is comprehensible. With the use of new technology, the program can translate the material automatically, thus further facilitating the process of learning from colleagues solving similar problems. On the other hand, in order for the systems to translate these learning materials, it needs to be explicit, bringing us back to Panahi, Watson and Partridge (2013) explanation of the mode of the knowledge. For example, Christopher and Sarah explain that video instructions where the

instructor is speaking is hard to automatically translate, and instead should create speak-less instructions or use generated speech features to automatically translate the materials. Therefore, we argue that explicit knowledge is easier shared over technical systems than tacit knowledge.

A substantial part of this thesis discusses and explains how technology enhances and facilitates organizational learning in many different aspects. However, it has become apparent that technology does not always serve the purpose of simplifying the learning process. On the contrary, even though previous research and several respondents explain situations where technology has made the learning process more efficient, there is still evidence of uncertainty. Christopher and Brian explain that the final goal is to see long-term efficiency and that the system today still needs further advancements. Michael further explained that today they cannot accurately measure whether the technology actually makes the learning process more efficient. This statement conveys an understanding that earlier mentioned situations where technology makes the learning process more efficient, is only an impression and interpretation of how organizational learning has changed. The challenge of accurately measuring if technology and new ways of learning can be explained by Yuvaraj (2011) statement that knowledge based jobs have increased in recent years, Will shares the same view. Another aspect that could explain why measuring if technology makes the learning process more efficient is that the digital transformation, caused by Covid-19 (Savić, 2020; Ozimek, 2020), is a recent event that forced the work environment to transform to a more digital approach, and the process has not been given time to be analyzed.

Furthermore, half of the respondents explain the 10-20-70 method which they act accordingly to in the operating department of the organization. The method consists of 10% theoretical knowledge, 20% of knowledge obtained by others and 70% of practical training or “learning by doing”. From this explanation, only the 10%-part of the method can be fully executed with the use of digital learning. The other two require hands-on training or physical interactions. The explanation of technology enhancing the knowledge flow (Giannakos, Mikalef & Pappas, 2019; Kimiloglu, Ozturan & Kutlu, 2017) can therefore not be applied in all cases. The physical training needing to persist can be explained by the mode of knowledge within the organization. In the sense of this thesis, the learning is observed from a manufacturing company, thus involving physical labor and therefore also physical training. Another conclusion of these statements is that technology can best enhance the theoretical knowledge that is expressed explicitly but is more challenging to implement when sharing tacit knowledge .

5.2 Development, Transition and Adaptation

The work environment is taking a more digital approach and is affecting the entirety of working (Ozimek, 2020) and therefore also the learning environment. When questioned about their experiences with organizational learning and how it had changed over time, several respondents acknowledged that the Covid-19 epidemic had a big impact on how their transformation had occurred. As noted several instances throughout this paper, the Covid-19 pandemic has fundamentally altered the workplace and the way we learn, with remote work now playing a significant role in many people's everyday lives (Ozimek, 2020; Savić, 2020). In line with that, Will and Olivia explain that before Covid-19 training had been done face-to-face and that quickly had to change and they had to adapt to digital solutions. Furthermore, David explained that before there had not been a lot of opportunities for self-learning and it had been a way more cumbersome process. With the development of technological solutions such as socio-technical systems, the learning process is shifting toward more autonomous means of learning and taking ownership of one's own development.

The learning process previously had been mostly hands-on with trainers teaching you how to do something without extensive documentation on the procedures involved. Christopher notes that in order to make this process simpler, they began turning these lengthy instructional texts into other media, such as short films, to make the learning process quicker and more effective. Furthermore, this accelerated the usage of virtual libraries, e-learning and video training became more common in the workplace. As previously mentioned, we argue that these digital learning methods are socio-technical solutions as they unite individuals and technology. The respondents' observation of this development is consistent with Savi's (2020) assertion that the Covid-19 pandemic dictated that businesses enhance their use of information technology and make the most of its capabilities, including e-learning, video conferencing, and IT. Moreover, as David argues, the digital transformation and the shift toward socio-technical systems made the learning process easier and provided them the chance to develop training for the appropriate individuals, with the necessary abilities for their particular positions.

Furthermore, our respondents gave insightful responses when asked what they thought would be required for the adoption of new technologies or systems to be successful and how those who may be hesitant about it should be managed. As Rêgo et al. (2021) mentioned as a result of the Covid-19 pandemic both individuals inside organizations and the firms themselves require direction in the constantly evolving environment. As stated, managers and leaders

going through technological transformation have to keep a close eye on their employees and need to inspire, motivate them as well as provide support (Trenerry et al. 2021). A leading view in our findings discussion was that managers should provide a purpose and an understanding for their employees and highlight what is in it for them, why it is necessary and why it is useful to them. Trenerry et al. (2021) explain that a responsive leader in managing digital transformations is one who has the skill to make quick adjustments and decisions, is communicative and responsive as well as good at managing connections and has technical skills. How employees receive a new technology can be highly influenced by how the leader introduces it to their employees, as James mentioned. Furthermore, David explains that it is important to get people excited and motivated for it and Jennifer adds that solid direction, guidance and support are key elements that make effective technological adoption for employees.

In addition, the aspect of how people perceive the usefulness of the technical learning systems can have an impact on how individuals adapt to and receive them. Olivia notes that uncertainty and change is something that people generally are scared of or hesitant towards. Furthermore, Jennifer explains that managing and understanding people's attitudes is imperative when trying to implement or adapt to new technologies. Davis (1989 cited in Trenerry et al. 2021) explains that understanding people's attitudes is imperative and two factors can predict their belief in the technology. The TAM model discussed previously predicts how valuable employees believe the technology to be and how user-friendly they believe it to be for them (Davis, 1989 cited in Trenerry et al. 2021). An issue Sarah mentioned is that some people still are of the belief that face-to-face learning is more beneficial. Therefore, it is important to work with people's mindsets and explain to them why the use of socio-technical systems for learning is useful and how it will benefit them. Another topic several respondents mention is the human factor and that people's mindsets towards only doing virtual learning or virtual meetings was negative in the beginning of the pandemic. Christopher and Sarah share their views and state that after the pandemic happened, today some people actually prefer the virtual way. This highlights the importance for managers to listen to their employees and their needs, as people have different views and opinions of what they want and need, additionally ensuring a successful implementation and adaptation to socio-technical systems for organizational learning.

Furthermore, James and Will discuss different components that are challenging when adapting to new technologies. A prominent aspect is that generational differences can have an impact

however, it is hard to generalize on this topic. In our discussion with our respondents, there were contracting views on whether generational differences were a factor on the adoption process of technological solutions. James, Michael and Peter explain that it is possible that older generations can be more hesitant towards technological solutions, however Will explains that there can be instances where this statement is not prevalent. Additionally, Michael mentioned that the attitude of believing that using digital methods of learning will be more prevalent in the future and Peter points out that when the younger generations come into the work-force it will be easier to adapt to. This correlates with the study Dutta and Borag (2018 cited in Trenerry et al. 2021) did where they found that older workers did not have strong negative opinions on technological advancements. On the contrary, individuals who had a long work-experience with that company could be more hesitant towards it as they could be used to the old ways of working. With these differing opinions, we can assume that it is highly circumstantial that older generations are very hesitant towards technology and it is hard to make distinctive generalizations on this topic.

5.3 Socio-technical Balance

A significant subject matter in our findings is how critical it is to find the relationship between people and technology and how it should be managed. Many of the respondents emphasized how important it is to have a balance between people and technology, adhering to Stein and Vandebosch (1996) assertion about the different rates of progress between individuals and technology. Overall, the respondents were unanimous in the view that learning using digital tools can be achieved in one shape or another. However, human interaction was said to always be important. Peter, Jennifer and David are of the same view that we will always need people and their expert opinions for assessing things that technology cannot. Sarah provides a contradicting view by stating that one of the biggest challenges today is convincing people that digital learning is better than physical learning, thus indicating that her view is in favor of the use of technology for organizational learning. Giannakos, Mikalef and Pappas (2019) explanation of technology being a tool for enhancing organizational learning can in this sense be interpreted as not a way of diminishing the physical proximity of learning, but instead serve as a support where it enriches and facilitates the learning. Thus, Sarah's statement, although contradicting the other respondent, can be construed as follows: If technology can be utilized to enhance the learning process significantly, it should be employed.

Additionally, Fuchs and Reichel (2023) discuss how technology can enable both efficient communication as well as inefficient. Technology has the benefit of fast communication however, that requires individuals to communicate back in the same manner. Sarah provides an anecdote of her working with a colleague for five years, completely remotely, adhering to Fuchs and Reichels (2023) statement of technologies use, and explaining how it has worked out great. Nevertheless, if the individuals interacting through digital channels would not be aligned with the technology and not operate it competently or consistently, the technology would be ineffective in serving its intended purpose of facilitating communication. Sita and Chitale (2012), explain that human interaction will always be important but highlight how important it is to develop these digital systems in order to combine the human and technical aspects of communication. Additionally, they emphasize the importance of developing digital systems that enable individuals to share their knowledge and that they get recognition for their efforts and knowledge sharing (Sita & Chitale, 2012). Socio-technical systems need to be created in alignment of the users in order to improve the performance (Stranks, 2007).

As Stein and Vandebosch (1996) stated, depending on the situation at hand and the desired result, learning may be put into practice in a variety of ways. That is where the socio-technical aspect or socio-technical systems (STS) comes into the discussion. Strank (2007) explains that they are the interaction between people and technical systems. This aspect is what many of the respondents make an emphasis on and how important it is to have the technology in place in order to support individuals in their work not with the aim of replacing them. Socio-technical components therefore also work in tandem with making sure the people adapt to the new technology, adhering to a.i Trenerry et al.'s (2021) explanation of the importance of people's responsiveness and disposition towards technology. Olivia's observation that people tend to be afraid of change and the unfamiliar reinforces the importance of emphasizing peoples readiness and attitudes to technology. Furthermore, Stranks (2007) states that STS may benefit organizations greatly and help them in developing more user-friendly and efficient systems to achieve their goals. Implementing STS and co-creating them to be meaningful and tailored to their users is crucial for their effectiveness (Mumford, 2021). Several respondents highlight this point, and the training material should be relevant and created for the end-users and their needs. Furthermore, the technology's usability is important to ensure that people actually use it; if it is too difficult or complicated to use, there is a risk that people will not.

David and Brian mention that learning or training digitally can have a few drawbacks and they treasure face-to-face interactions. They mention that using technological systems for learning

or training can run a higher risk of lack of focus faster than with human interactions. Furthermore, there needs to be some excitement and motivation in order to learn using a combination of teaching methods. Moreover, Jennifer points out that networking and learning from others by creating soft skills are aspects that cannot be forgotten and will always be important. The only instance where a respondent deemed technical solutions to be superior and that face-to-face interaction was not necessary was in the context of collaborating on a project not in the sense of learning.

5.4 Mapping, Measuring and Connecting Competency through Socio-technology

An evident part of our finding is how to detect and connect skill and knowledge gaps with the use of technology. Several respondents explained the skill matrix that is used to map out what people know and what they should know. The skill matrix also has the feature of connecting different job roles to different skills, which also enables people to reach out to coworkers with similar job roles for assistance or help. Furthermore, Kaur and Kumar (2013) explain the skill matrix in a similar way, but instead call it competency mapping. The difference with the terms skill and competence is that competence is a collective work which consists of 4 key components; skill, knowledge, personal attributes and behavior (Kaur & Kumar, 2013). However, from the interviews it is evident that the skill matrix also contains theoretical knowledge, but that they aren't indifferent to the two. This is e.g. explained by Will, who stated that the company is working with targeted and ideal levels of skill. Level 1 is little to no knowledge, level 2 is some theoretical knowledge, level 3 indicates that the person has the ability to handle the skill and level 4 is achieved when an employee masters the knowledge and also can teach it to others. In addition, Kaur and Kumar's (2013) explanation of personal attributes and behavior indicates that those can be connected to level 3 and 4 of the skill matrix, hence a person's ability to exercise the skill is not solely determined by their level of theoretical knowledge. Yuvaraj (2011) additionally states that competence only describes what a person should do, and not how, which also amplifies the statement of skills not being an adequate explanation of what someone knows.

Will also explained that the need for a skill matrix was considerably more and more important when the company was expanding and having increasingly more skills connected to employees. Yuvaraj, (2011) also explains that the use of competency mapping is becoming increasingly

important hence there is an increase in knowledge based job roles. Will and Yuvaraj, (2011) share the impression that there is evident need for competency mapping hence the increase in skills and knowledge in the workplace. Kaur and Kumar (2013) also state that the use of competency mapping is important in order to understand and analyze what competence exists within a company. In addition, Christopher and Jennifer explain that the process of detecting and documenting skills has developed over the years, going from a more autonomous and manual way by using Excel to a more digitized way by using new socio-technology. The new digital way of documenting and mapping the skills enables it to be easier found, shared and foremost detecting skill gaps.

The socio-technical way of documenting employees' competencies we argue is a socio-technical system and research on this topic led us to what is called the competency-based HRIS. Sharma and Malodia (2022) explain that HRIS is used to gather, analyze and spread data about the employees (Sharma & Malodia, 2022). Furthermore, they mention that a competency based approach can be included into HRIS to identify competencies and skills and who has the necessary knowledge for what role. Even though our respondents mention that such a feature is in place within their organization, the use of competency-based HRIS seems to exclusively identify competencies and necessary skills and not assist in filling in those gaps detected by the system. Same goes with the digital dashboard model, it is solely for documenting competencies, personal information and identifying gaps of their employees, not necessarily that the system automatically bridges the gap (Munthe, Baswardono and Satria, 2019). In addition, Christopher states that the real challenge is then using and analyzing the data in order to determine where more training needs to be done, which correlates to Kaur and Kumar (2013) statement that the competency mapping is a tool for facilitating the analysis.

However, several respondents explain that the detecting skill gaps have a distinct role in reducing and preventing losses within the company. Will states that working with skill gaps you can be preventive and proactive in order to reduce losses. Yuvaraj (2011) on the other hand explains that it is important to communicate the required competence in order to bring the people and organization together. Well communicated expectations of what competence the company requires also facilitate employees to efficiently perform their role (Yuvaraj, 2011). Michael additionally says that the skill matrix enables you to see "...who is actually trained on what, then we can actually begin to link that as well with the losses that we have out in our factories". Kaur and Kumar (2013) share similar views that competency mapping enables personal development and establishes what is expected from the company. As mentioned

earlier, the technology facilitated the competency mapping, which then facilitates the possibility to detect gaps, which then can be worked on by for example providing learning material in order to prevent and reduce losses within the company.

As previously mentioned in this section, Michael offers a perspective that a current challenge is to precisely assess whether socio-technology systems actually enhance the efficiency of the learning process. Giannakos, Mikalef and Pappas (2019) explanation of TEOL - technology enhances organizational learning is questioned. How can the use of technology for a more efficient learning process be motivated if the process cannot be analyzed? However, even if the learning process using technology itself can not be evaluated, technology can identify the association between competence gaps and losses within the organization, explained by Will. Boucher, Bonjour, and Grabot, (2007) additionally explain that competency and the available knowledge have an impact on the performance. This example demonstrates where technology has a distinct role in similar circumstances, as it may not definitively enhance the learning process in an organization, but it has a vital function in identifying competency gaps.

6. Conclusion

The purpose of this research is to enrich and contribute to existing literature on the topics of socio-technical systems and how its utilization supports and fosters an environment for organizational learning. Furthermore, presenting crucial aspects that are influenced by or have an influence on socio-technical systems. We gave our empirical findings merit based on existing literature in the previous section, including our own interpretations and arguments. Therefore, this section sheds light on how our empirical findings, along with our interpretations and arguments supports and contributes to existing literature. Moreover, we will discuss the practical implications of our research. Finally, we will present the limitations of our research as well as propose future research possibilities within the topic of organizational learning and socio-technology systems.

6.1 Theoretical Contribution

This research contributed to an understanding of the concept of socio-technical systems in alignment with organizational learning, shedding light on optimal utilization scenarios and identifying key enabling factors for the effective implementation of these systems.

Organizational learning is connected to the performance of the company (Argote & Hora, 2016; Stein & Vandenbosch, 1996), the higher level of acquired and used knowledge, equals a better performing company, which in turn can provide a competitive advantage (Škerlavaj et al. 2010). The utilization of socio-technical systems facilitate knowledge sharing in several scenarios, which is exemplified in the findings as collaborative work containing the sharing e.g. global competencies and global best practices. However, we argue that the mode of knowledge plays a vital role in harnessing the benefits of socio-technical systems. Despite the facilitation of sharing tacit knowledge by socio-technical systems (Panahi, Watson & Partridge, 2013), the respondents conveys that in order for the learning content to be most efficiently communicated it is most beneficial for it to be explicit. For instance, the use of generated speech features enables automatic translation, overcoming language barriers and enhancing the learning experience.

A prominent aspect of this thesis is the discussion of the change and transition toward a more digital approach in the workplace, caused by Covid-19 (Ozimek, 2020; Savić, 2020) and the constant technological advancement (Rêgo et al. 2021). In line with Stein and Vandenbosch

(1996) statement that people and technology do not advance at the same pace, it is vital to ensure a successful adaptation and implementation of new technological systems for it to be utilized efficiently. The findings present important factors such as clearly explaining the purpose of implementing new technology, and working with people's mindset by inspiring and motivating employees, aligning with Trenerry's et al. (2021) research. In line with the utilization of socio-technical systems to align people and technology, we also suggest that the relationship is reciprocal and people need to be aligned with socio-technical systems for it to be used purposefully. In essence, while socio-technical systems aim to unite individuals and technology, the prerequisite for such integration is that individuals first harmonize and adapt to the socio-technical system, thereby establishing a cyclical process.

As socio-technical systems are used to align people and technology (Stein & Vandenbosch, 1996; Stranks, 2007), it is vital to emphasize the approaches from a people-perspective (Bednar & Welch, 2019; Mumford, 2001). The findings convey that the implementation of technology is not done with the purpose to replace people, but rather support them. In accordance with Giannakos, Mikalef and Pappas (2019) explanation of technology being a tool for enhancing organizational learning, we suggest that socio-technical systems should not be a way of diminishing the physical proximity of learning, but instead support where it enriches and facilitates the learning, thus contradicting instances from the findings that conveys technology-based learning being superior. In this sense it is crucial to maintain the balance between people and technology, by prioritizing user-friendliness and fostering motivation and excitement for using the systems. The findings reveal that in certain instances, technology does not effectively facilitate learning, as there are situations where physical proximity remains indispensable. This further emphasizes the significance of striking a balance between the role of people and technology in the learning process.

6.2 Practical Implications

This research provides practical insight and contributes to an understanding of the interplay of socio-technical systems on organizational learning, and shows that technology is not suitable in all circumstances. The findings indicate that several respondents express a strong preference for using technology for learning. However, it is important to note that there are instances where technology does not effectively support learning, and physical proximity remains an

indispensable method. As a result, a key insight from this study is the need to foster a balanced understanding that technology is not suitable for every learning situation.

As mentioned in our discussion section, the findings indicate that in order to completely understand the dynamics of organizational learning, the skills matrix is insufficient. We contend that the manner in which organizations map and measure competence, coupled with linking losses to potential gaps, is closely intertwined with organizational learning and socio-technical systems. The findings highlight the growing significance of competency mapping, particularly in response to the expanding knowledge landscape, which aligns with Yuvaraj's (2011) observation of the rise in knowledge-based job roles. The findings reveal a comprehension that the term "skill" is utilized without its complete meaning, whereas Kaur and Kumar (2013) expound on the manner in which organizations navigate and map these attributes as "competency," encompassing skills, knowledge, personal attributes, and behavior. Aforementioned, Sharma and Malodia (2022) explain these systems to be useful for documenting and connecting competencies, as well as identifying gaps, however, overlooks the learning aspect.

We therefore suggest that although socio-technical systems facilitate mapping and measuring competency, it does not encompass an individual's personal attributes and behavior, and overlooks the entirety of the learning process. However, competency mapping establishes what is expected from the company (Kaur & Kumar, 2013) thus aligning individuals and the organization and in addition facilitating efficient performance in employee roles, resulting in the technology enhancing organizational learning (TEOL) addressed by Giannakos, Mikalef, and Pappas (2019). In addition, addressing skill gaps in a proactive and preventive manner aligns with the notion of working with socio-technical systems, as it can contribute to mitigating potential losses.

6.3 Limitations

Qualitative research, including our study, has inherent limitations due to its subjective nature, making generalizations challenging (Bryman & Bell, 2011). Furthermore, as Rennstam and Wästerforst (2018) state qualitative research is at its core about attempting to understand meaning from individuals therefore, it is difficult to attempt to generalize on the topics where unstructured or semi-structured interviews are used because in other the results can change drastically in other circumstances (Bryman & Bell, 2011). Moreover, as Alvesson (2011)

states, in qualitative research, gathering data is usually face-to-face in the form of interviews and performing them via media such as Microsoft Teams can be seen in poor form. Therefore, another limitation to our research is that we performed all our interviews via Microsoft Teams where we miss out on body language and other physical indicators.

Additionally, even though attempts were made to explain the purpose of our research and what we meant with organizational learning and technology for learning purposes some of our respondents deviated from the intended discussion. That made the process of coding and analyzing our data more strenuous as some of the answers were not from the learning perspective. Our data therefore, became more limited, and again, difficult to make any generalizations on the topic. Furthermore, as this research was in collaboration with one organization, the topic of interest had to be relevant and beneficial for the company. As a result, another issue to take into account is that the respondents were all from the same organization and could have the best interest of the organization in mind which could have affected our results. As Alvesson and Kärreman (2011) mention, when researchers speak with their respondents on a certain topic, the researchers cannot assume that the individuals are expressing their authentic truths. It is possible that the respondent is expressing accepted organizational truths or professionally motivated truths rather than true meaning and understanding.

6.4 Future Research

Throughout our work, we encountered the need to prioritize our research focus on socio-technical systems within the context of organizational learning. Initially, our topic encompassed a broad range of technology and its impact on organizational learning. However, to ensure clarity and efficiency, we narrowed down the scope to emphasize the specific aspects of socio-technical systems. Thus, we made the decision to exclude certain topics from our findings, such as External Reality (XR) and Artificial Intelligence (AI), which refers to future technological advancements in organizational learning. Due to limited insights and lack of respondent belief in the technology's maturity, we were unable to prioritize and extensively explore these particular topics. Nevertheless, a few of our respondents acknowledged the potential of using XR and AI for learning in the near future. However, they expressed concerns about the current state of technology, indicating that it is not yet sufficiently advanced. They emphasized that the investment required to implement XR and AI may not be justified at present, as it may not add significant value to the learning process. Therefore, we propose that

future investigations should explore the potential value of XR and AI as a socio-technical system for organizational learning.

Additionally, an area for future research that emerged but was not explicitly addressed in our interviews is the contrasting perspectives on face-to-face learning versus technology-based learning among white collar and blue collar managers, particularly considering the distinct work dynamics they have within a manufacturing organization. We discussed both with white and blue collar managers, and could see differences in their understanding when it comes to organizational learning and whether socio-technical systems are efficient for learning. As many of the blue collar managers were of the opinion that face-to-face learning was the optimal method for learning and white collar managers conveyed a preference for using technology for learning. This brings about an interesting paradigm as blue and white collar employees work in different environments, therefore influencing their views. While these contrasting views were highly interesting, our intended research did not take this into consideration. Therefore, we were unable to accumulate sufficient material to construct a cohesive argument on this particular issue, making it a valuable suggestion for future research.

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Appendix A - Interview guide

Appendix A shows the question guide used in this research in its entirety.

1. Can you tell us a little bit about your title and what you do at StexCore?
 - a. How long have you been at StexCore?
 - b. Different departments/locations?
 - c. What are you working on right now?
2. What sort of technology do you recognize is used for learning within StexCore?
3. Do you recognize a change or development over the years when it comes to organizational learning?
 - a. What has been developed?
 - b. What still needs development?
 - c. Have you seen the learning-process being more efficient with the use of technology?
4. How would you describe the learning environment at StexCore?
 - a. How is learning influenced by technology?
 - i. What is done with technology vs. on site?
 - ii. Learning by doing or following instructions/manuals?
 - iii. Is some learning better done physically than with technology?
5. Can you talk about a time when you had to adapt to a new technology in your role?
 - a. How did you handle it and what did you learn from the experience?
6. How does your organization address the skills gap and ensure employees are equipped with the necessary skills for their roles?
7. What are the challenges you have come across using technologies for learning
 - a. Do employees express positive/negative attitudes towards technology?
 - i. How do you manage people that are hesitant towards technology?
 - b. Have you experienced a situation where technology has been badly implemented?
 - i. What was the main cause of not being successful?
 - ii. What would be done differently?
8. Can you discuss your stance on how a balance is managed between people and technology?
 - a. What challenges have you recognized?

9. Can you talk about any recent or upcoming projects/initiatives related to learning and technology?
10. Is there something you would like to add?

Appendix B - Illustration of coding

Appendix B illustrates three samples of the coding sheet to demonstrate its format and structure.

Question	Answer	Code	Theme
8	"We have to have eyes to compare quality, we have to have eyes to recognize safety risk, we have to have humans to teach other humans you know with the hands on" (David)	Human Interaction	People vs. Technology
4	"We tried to work from the beginning with this skill gap. Because when we establish different skill levels, people also try to have a target skill level and even an ideal skill level [...] what is your final vision, what is your final goal" (Will)	Skill Matrix	Mapping Competency
3	"Using that we developed standard operating procedures and the checklist, everything that I talked about based in a way that it's global best practices are used. The operators then can use the system linked to the global competence library" (David)	Global Competencies	The Impact of Socio-technical Systems