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DISTRIBUTED TEAMWORK AT HITACHI ENERGY GRID AUTOMATION SYSTEMS

Master's thesis
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I hereby declare that I have compiled the thesis independently
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has not been previously presented for grading.

The document length is 17777 words from the introduction to the end of the conclusion.

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TABLE OF CONTENTS

ABSTRACT

Entering the post pandemic work era with more freedom to choose when and where to work has created a need for many companies to rethink their way of working. Prior to the pandemic most companies expected their employees to work in the office during fixed hours making it easy to monitor ones work effort and presence. With the relevant technology, one can set up a workstation literally anywhere where there is sufficient internet to conduct ones tasks for the day. Before the pandemic, working remotely was frowned upon in most engineering circles at Hitachi Energy Grid Automation Systems (HE GA Systems). This was something reserved only for specific roles in certain sales and management positions. Since the pandemic, the company and the Engineering Operating Unit (EOU) have opted for a distributed working method where employees and leaders are often in different geographical areas and have no physical contact with one another. This has resulted in many specialists leaving the company mentioning unclear direction and difficulties with remote working. This research was executed together with the EOU in order to gain insights from the distributed employees who are scattered around Europe with an intention of improving the support methods for distributed working. Based on a mixed method research, the aim of this study was to provide a set of recommendations for the company on how to lead their distributed teams across Europe. The research identified nine collaboration and communication challenges to which the author proposed recommendations for mitigation of these effects.

Keywords: distributed team, distributed leadership, remote leadership, remote teamwork, virtual team relationships.

Abbreviations

EOU- Engineering Operating Unit

GA- Grid Automation

HE- Hitachi Energy

ICT- Information Communication Technology

MS Teams- Microsoft Teams

SCADA- Supervisory Control and Data Acquisition

INTRODUCTION

Modern workplaces are increasingly embracing dispersed labour, particularly because of the COVID-19 pandemic which made it relevant (De Smet *et al.*, 2020). If businesses adopt distributed working methods and begin to outsource business activities to the distributed workforce, they can realise significant cost savings and access the global talent pools (Anderson, 2017). The working methods which were thought unachievable for many professions a few years ago have now become the norm (Mauer *et al.*, 2022). Many companies have opted for a remote working framework giving their employees more freedom to decide where to work from (Davidavičienė *et al.,* 2020); the company where this research was conducted also opted for remote work.

Hitachi Ltd. is a multinational conglomerate which has its main office in Tokyo, Japan and as of March 2022 the company employs more than 360 000 employees. The company operates in the field of digital systems and services, energy and mobility, connective industries and in the automotive systems business (Hitachi Ltd., 2023). Hitachi Energy is a company which is part of the Hitachi Ltd. corporation that employs approximately 40 000 people in more than 90 countries and the company operates in the field of utilities, infrastructure and industry sector. Their products can be found in more than 140 countries across the globe (Hitachi Energy, 2023).

Hitachi Energy Grid Automation Systems Engineering Operating Unit (HE GA Systems EOU) is a unit within Hitachi Energy (HE) that designs and delivers substation automation systems to utilities and power generation companies in Europe and to export markets with focus on the Middle East. Since the start of the pandemic, the company has gone through a series of changes which have resulted in more freedom to choose where one works from. In addition, the company has introduced the operating unit hub model by removing country-based organisations and creating teams that collaborate over different regions and work across different time zones. The unit has been operating this way since late 2021.

Since the introduction of the hub model and the distributed working teams, the company has had a problem with experienced employees leaving while mentioning unclear direction and struggles with distributed working and leadership. This has resulted in the company losing out on critical knowledge and skills causing loss of money that have been invested into training their employees

in addition to effects on knowledge sharing, onboarding and to other indirect consequences. Further, losing key people might impact ongoing projects and hence the company by reducing business opportunities. The aim of this research is to provide a set of recommendations for HE GA Systems EOU using the collected information on how to lead their distributed teams across Europe to improve the collaboration and communication between the teams and their leaders. The research supports to satisfy the needs and demands of the current workforce and secure the existing expertise for the company.

The research questions to be answered in this thesis are the following:

1. What are the main collaboration and communication challenges in distributed teams at HE GA Systems EOU?
2. What are the best practices of distributed leadership at the EOU?
3. How to overcome these challenges in distributed teams at HE GA Systems EOU?

The following tasks have been identified to carry out the research for the abovementioned questions:

1. research the available literature to find out the main challenges concerning collaboration and communication in distributed teams and to collect best practices for distributed leadership;
2. conduct an online survey in the company using a questionnaire and analyse the results;
3. conduct interviews with the functional managers to gain insights into the main distributed working challenges and gather best practices for distributed leadership;
4. compile a set of recommendations with regards to supporting and leading the distributed workforce based on survey and interview results.

The author of this research works as an Engineering Manager for the company and is based in Sweden, with most of his team members located in other countries. Due to the specifics of the industry, the company invests time and resources into educating and training their employees. With distributed working, it has become evident to the company leaders that some of the employees need more in person contact and attention. In addition, there is a need to provide clearer instructions for managers and team leads on how to lead their teams remotely (Wittmer & Hopkins, 2022). This, together with inflation and demands for wage increases, created an increased risk for losing experienced and skilled employees if companies do not meet their needs (PriceWaterhouse Coopers, 2022). The author wants to learn on how to further accommodate the needs of HE GA

Systems EOU employees and support their remote working style, and to provide its leaders clearer instructions on how to lead their distributed teams. The HE GA Systems EOU has a wide variety of working frameworks which differ in many countries. In this thesis the author is focusing solely on the distributed working model often incorporated with their line manager working out of another country. Hence, all members are geographically distributed from one another and have no daily in-person contact with their team nor their manager.

The master's thesis is divided into three chapters, in the first chapter the author provides the literature review and theoretical background on the distributed working challenges and leadership requirements. The second chapter, the empiric research is explained with the description of the sequential mixed method research, sample selection, data collection and data analysis methods. In the last chapter, the result from the qualitative research is analysed and complimented with results from the quantitative survey compared against the theory with authors interpretations. In the end of the third chapter the author provides the recommendations for the company.

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The author of this thesis would like to express his gratitude to the employees who participated in the questionnaire and to the functional managers who agreed to take part of the interviews. In addition, the author would like to thank Ulrika Ritzen, Ragnar Tomstad and Axel Hahn in mentoring the author over the years and for supporting his development. A very special gratitude goes also to the thesis supervisor Susanne Durst who managed to guide and motivate the author over the research period. Last but not least, the author would like to thank his family for the unwavering support during the research period.

1. THEORETICAL BACKGROUND

In this chapter the author provides the relevant literature overview and key concepts to working in distributed teams. In addition, the author provides the theoretical overview of distributed teams, challenges with distributed working environment and distributed leadership.

1.1. Distributed teams

1.1.1. Conventional teams

Salas *et al.* (2008, p. 34) define conventional teams as "groups of people who work together in common area of environment, with clear objectives and formal rules governing their interactions." The major difference between conventional teams and distributed virtual teams is that the virtual teams are physically separated from one another in contrast to those in traditional, conventional teams who are seated next to one another (Zimmermann, 2011). According to Bell & Kozlowski (2002), the actual distance and technology mediated communication are the two key qualities that set virtual distributed teams apart from traditional teams. Conventional teams often have a hierarchical leadership structure while distributed virtual teams often have a flat leadership structure (Seliverstova, 2022).

1.1.2. Distributed teams

Working in distributed virtual teams which span over several countries and collaborate over time zones has been in practice for decades (Bell & Kozlowski, 2002; Lurey & Raisinghani, 2001; Bell, McAlpine & Hill, 2019; Davidavičienė *et al.*, 2020; Braesemann *et al.*, 2021). During and after the Covid-19 pandemic distributed work, which used to be part of selected professions and more prevalent in certain industries, became a reality for many jobs (Miyake *et al.*, 2022; Braesemann *et al.*, 2021). Now, majority of the Hitachi corporation companies practice some form of distributed working method across the world, that being either fully remote, hybrid or in-person working method. At HE GA Systems, the working structure is distributed work which in the context of this research is considered as a fully remote working method.

There are many definitions of virtual or distributed teams. Kirkman *et al.* (2002, p. 67), for example, defined distributed teams as "a group of people who work interdependently with a shared purpose, across space, time and organisational boundaries, using Information Communication Technology (ICT) to communicate and collaborate." Townsend *et al.* (1998, p. 18) defined virtual or distributed teams as "groups of geographically and/or organisationally dispersed co-workers that are assembled using a combination of telecommunications and information technologies to accomplish an organisational task."

Bhat *et al.* (2017) described the following four attributes which describe distributed teams: They are transient (assembled for a specific job), multicultural (representing several nationalities and languages), geographically scattered (operating from distant locations), and technologically connected (using ICT for communication). This is also applicable for HE GA Systems EOU as it operates mostly based in Europe across different countries and time zones delivering substation automation systems to the European Union and export markets. The EOU can be characterised as a hub unit which is connected by ICT, where workers from different nationalities form multicultural teams which are based in multiple countries and are assembled for specific projects. One distinct characteristic that these engineering teams share is that they don't have any physical contact during their daily activities.

As mentioned by Davidavičienė *et al.* (2020), working in distributed teams is often beneficial for the employees. The flexibility of working from home or a hotel room is advantageous to employees since it promotes work-life balance and raises employee satisfaction levels. In many cases, the EOU engineers travel to customer sites and spend days, weeks or even months away from their normal workplace often operating out of a customer site or a hotel room. Companies often benefit from having their employees operate in distributed teams. Due to advancements in ICT, employers gain from the availability of specialists abroad (Liao, 2017; Davidavičienė *et al.*, 2020). Distributed work requires an increased level of self-discipline and motivation which can be used as a selection criterion for employing an employee into a distributed working environment (Hoch & Kozlowski, 2014). Organisations frequently create distributed virtual teams when they need local knowledge and expertise (Braesemann *et al.*, 2021). As an example, one engineering team operating in one market region may add several remote workers because of their specialised knowledge (Webster & Wong, 2008). This is also applicable for the EOU organisation which, as an example, may have one team operating in Spain while adding an additional team member

specialised in specific protection engineering function from Finland. After removing country specific organisations and replacing them with the hub model, the EOU engineering teams have enjoyed the flexibility of balancing out their workload during peak periods using resources across multiple countries. In addition, the EOU has benefitted from complementing distributed engineering teams with specialised knowledge that provides the organisation a chance to tender to projects which in the past were unreachable due to country specific organisational limitations.

One benefit of distributed working worth mentioning is the increase in productivity when working remotely. A work from home experiment conducted in a Chinese company with more than 16 000 employees resulted in a performance increase of 13% (Bloom *et al.*, 2015). This, according to the study, was the result of two main factors:

1. fewer pauses and sick days gave the company employees more time to work in each shift;
2. higher focus and performance when performing tasks due to a more suitable, quieter environment compared to performing the same tasks at the workplace.

However, distributed teamwork also gives a new range of challenges for companies. To illustrate, companies may find it difficult to create a culture that is accommodating of distributed work which, if left unattended, may in turn be detrimental to the retention efforts and affect the employee satisfaction levels (Popovici & Popovici, 2020). This has also been the case at the EOU where several distributed employees have left the company feeling isolated or left without guidance by their remote manager and their organisation. In addition to the previously mentioned challenge, monitoring who is working remotely and when they are working is difficult when there is no formal agreement on working methodology across teams and countries. This brings the focus onto the larger organisational environment which should be supporting the distributed working method by focusing on developing the culture, principles, and control procedures (Peters *et al.*, 2016).

Distributed workers might be exposed to several professional challenges that might impact the company directly or indirectly. According to Van Wart *et al.* (2017) and Roman *et al.* (2018), some of the most prevalent issues brought on by the distributed working and digitisation of business are worker estrangement, absence of social ties and inadequate accountability. As described in Popovici & Popovici (2020), distributed workers might have difficulties receiving the necessary access to professional training and education opportunities (Leslie *et al.*, 2012). Additional problems may appear when employees work in a distributed working environment for extensive amount of time, they may become socially isolated (Charalampous *et al.*, 2019). With distributed

working comes also high autonomy which makes monitoring employees difficult. Distributed teams often work with highly cognitively demanding subjects, in a symbiotic way which is also autonomous when it comes to their nature of work (Hoch & Kozlowski, 2014). Distributed workers might put in greater effort into virtual teamwork if they receive compensation for their efforts (Hoch & Kozlowski, 2014).

The following section describes the main challenges with collaboration and communication in distributed working environments.

1.2. Challenges in distributed working environments

Since the start of the Covid-19 pandemic that forced many employees to work from home, companies have seen a need to invest into understanding the challenges of distributed work and how it affects their employees (Wittmer & Hopkins, 2022). Now, in the post pandemic work era, HE GA Systems has introduced structural changes mentioned before which, in addition to the distributed working model, have affected the traditional work environment. As a result, several experienced employees have chosen to leave the company and EOU has been struggling to fill these specific roles. It takes years, and in some cases decades, to become an expert in the power engineering field and it costs the company effort and resources to replace talent. In the following sub-section, the author describes the main challenges with collaboration and communication in distributed working environments.

1.2.1. Collaboration in distributed working environment

As mentioned by Camarinha-Matos & Afsarmanesh (2008), collaboration is a process in which partners share duties, assets, and knowledge in order to work together to accomplish a common objective while also sharing the risks and benefits that may arise along the route. As described by Montiel-Overall (2005), collaboration may simply be the partnership of a working relation, where parties spend a different degree of involvement and time.

Distributed team struggle with similar problems as teams that are collaborating in the same location. Levasseur (2012), for example, surveyed 58 executives and compiled the following Table 1 to describe the challenges in distributed teams.

Table 1. Summary of the many collaboration challenges in distributed teams

Collaboration challenges in distributed teams
Building a culture of trust among team members.
Overcoming lack of in-person communication.
Overcoming communication obstacles.
Coordinating the objectives of each team member.
Achieving clarity on the team's targets.
Guaranteeing that the group has the knowledge and abilities needed.
Guaranteeing the presence of adequate technical resources.
Managing role uncertainty.

Source: As described in Levasseur (2012), compiled by the author

To compliment the list of challenges as listed in the study by Levasseur (2012), the study called Google Project Aristotle, which was conducted in the company Google in 2012, examined the dynamics of effective teams and their research discovered that how well a team functioned as a unit was more important than who was on it (Duhigg, 2016). The five main outcomes of the factors affecting team effectiveness are the following: a) psychological safety, b) dependability, c) structure and clarity, d) meaning and e) impact.

The factors are all equally important in conventional teams as in distributed virtual teams. The important findings in the study are that the basic needs for safety, structure and clarity do not change when one starts working in a distributed team (Lenberg & Feldt, 2018). In addition, one would expect to feel meaning, dependability and that their work has an impact (Mendoza & Liedtke, 2015). One of the factors affecting team effectiveness the most is psychological safety (Lenberg & Feldt, 2018; Mendoza & Liedtke, 2015; Delizonna, 2017; Duhigg, 2016). As stated in Edmondson (2018), psychological safety relates to a person's impression of the possible repercussions when taking a risk with another person or their conviction that they may take risks without the fear of being seen as rude, inept, negative, or disruptive. Teams with high psychological safety levels have members who feel comfortable taking risks (Edmondson, 2018; Duhigg 2016). The individuals in the team feel safe that no one in the team will make anyone else feel down for admitting a mistake, raising questions, or proposing new ideas (Dusenberry & Robinson, 2020). In order to foster psychological safety, the team members need to trust one

another. Trust carries a variety of meanings. It involves having faith in somebody, having trust in others, or feeling secure in their presence (Macaulay, 2020).

Using self-management and empowerment may improve distributed team performance (Kirkman *et al.*, 2004). HE GA Systems may benefit from shared leadership when it comes to the collaboration problems within and across their distributed teams. Shared team leadership is simply a process where the distributed team members guide one another toward achieving goals (Day *et al*., 2004; Pearce & Conger, 2002). Common decision making and responsibility are some of the characteristics of shared team leadership. It is thought to strengthen ties between teammates, promote trust, cohesion and commitment, and reduce the drawbacks of collaborating in geographically separated distributed teams (Pearce & Conger, 2002).

Effective ICT tools for documentation and information management systems are important for effective collaboration (Hoch & Kozlowski, 2014). Reducing the effects of anonymity, distance and lack of control can be achieved by managing these systems to enable connectivity, eliminate perceptions with regards to distance and facilitate the accessibility of information (Hoch & Kozlowski, 2014). This in turn supports the distributed team collaboration and performance.

A company's competitiveness often derives from its intangible assets, such as knowledge and the process of knowledge transfer, as opposed to its material assets (Navimipour & Charband, 2016). Knowledge is a critical intangible asset which can affect company competitiveness compared to their competitors (Davidavičienė *et al*., 2020). Knowledge retainment and transfer is a critical problem in many companies which have distributed employees who are subject matter experts as it is in the HE GA Systems EOU. Businesses like HE GA Systems may benefit from utilising industry professionals who are entering or have entered retirement age together with distributed working methods. This may help to facilitate knowledge transfer, and connecting experienced members of the team with less experienced ones would foster collaboration (Bal *et al*., 2012).

1.2.2. Communication in distributed working environment

As mentioned in Bell & Kozlowski (2002), communication in virtual teams can be explained as a process for exchanging information, ideas, and feedback using ICT tools among team members who are geographically dispersed. There is a vast amount of literature on how to improve communication, which is generally defined as the process of conveying information, meaning and understanding between two or more parties (Berry, 2011). According to Flanagin & Waldeck

(2004), communication is essential for organisational socialisation, which includes sense-making and connection.

Virtual or in-person communication is essential for getting any organising or job done since it provides the fundamental building blocks for teamwork, decision making and action to accomplish organisational goals (Berry, 2011). The major distinction in communication between a distributed team and a conventional team is that a distributed team relies on computer-mediated asynchronous information and knowledge dissemination, which enables many dialogues to take place simultaneously from multiple parties (Berry, 2011).

Distributed teams are typically white-collar, knowledge-based jobs which require a high level of communication and information (Seliverstova, 2022). One of many difficulties with distributed teams is characterised as using efficient communication techniques (Levasseur, 2012). Effective ICT tools for collaboration are important for effective communication (Lee, 2015). Smaller misunderstandings or communication breaks may have a detrimental impact on the functioning of the team (Wang *et al*., 2020). Distributed teams frequently struggle to foster a sense of commitment, coherence, and trust among their members (Dazzi *et al*., 2021). There is also a higher risk of miscommunication, greater obstacles to building trust, and more difficulties coordinating tasks when both managers and team members rely on electronic communication to interact with one another to perform their tasks (Liao, 2017). This would imply that companies would benefit if their teams got together in-person when they start working as a team. Once interpersonal relationships are created, the potential consequences for communication may be that the teams are less affected by the lack of in-person contact in virtual teams, however when one does not have in-person contact then developing interpersonal relationships over virtual channels may be difficult (Hoch & Kozlowski, 2014).

In addition to verbal communication, body language can also play a significant role in how well people understand one another. Without nonverbal clues, the emotional encasing of the setting could be lost, and this could result in misunderstandings amongst team members (Bohannon *et al*., 2013). This implies that there could be some degree of mistrust and ambiguity as a result. In addition to having enough virtual exposure to the team members, cultural and language differences may have a direct impact on communication between team members (Leung & Wang, 2015). Cultural differences are seen to enrich the knowledge and viewpoint however value and norm discrepancies can lead to misunderstanding and other intercultural problems (Leung & Wang,

2015). In addition to cultural barriers, completing a team with a distributed worker from another language environment may become an issue when interpreting messages based on their own language and cultural background (Davidavičienė *et al*., 2020). This creates a need for not only managers but also all employees to cultivate multicultural awareness, strong bonds, and trust to communicate effectively across cultural boundaries (Davidavičienė *et al*., 2020).

In order to summarise some of the communication challenges that occur in distributed teams the author has compiled the following Table 2.

Table 2. Summary of the many communication challenges in distributed teams

Communication challenges in distributed teams
Efficiency of communication techniques.
Lack of nonverbal clues.
Language and cultural differences.
Lack of socialisation and in-person contact.
Technological issues.

Source: Compiled by the author

As the information exchange is done over electronic channels using often only a video camera then the lack of nonverbal clues might inhibit understanding of one another. That combined with language and cultural differences might further push parties apart. Further influenced with lack of socialisation and in-person contact, together with possible technological issues that the electronic communication channels might be exposed to all create melting pot for difficulties in collaboration and communication if not managed correctly.

1.3. Virtual distributed leadership

The role in leadership within teams can be defined as influencing and directing a group of people toward a common objective (Carter *et al*., 2013). With the introduction of ICT, organisational structures have become flat and more distributed, but this has also enabled the organisations to become more dispersed (Cortellazzo *et al*., 2019). Virtual distributed teams are often cross functional which means that they often combine members from different functions (Pearce *et al.,* 2009) in addition to combining people from several cultures (Leung & Wand, 2015).

The new post pandemic reality has created a need to require new skills when it comes to virtual leadership (Wittmer & Hopkins, 2022; Sethi & Brown, 2022). It has never been easy to lead people or teams in physical setting and it is even harder to do that in virtual setting (Wittmer & Hopkins, 2022). If one only relies on conventional social skills like active listening or comprehending people's feelings and viewpoints, then traditionally that has been enough to lead an in-person team. However, to lead a distributed team one needs not only to master social techniques but also to become proficient in a range of virtual communication practices (Roman *et al.,* 2019). As per Carte *et al.* (2006, p. 326), "while leadership in the more traditional face-to-face context may emerge using a variety of mechanisms, in the virtual context it relies largely on the communication effectiveness of the leader." Roman *et al.* (2018, p. 5) describes this ability as e-communication and defines it as "the ability to communicate via ICTs in a manner that is clear and organised, avoids errors and miscommunication, and is not excessive or detrimental to performance." It seems that leaders cannot lead the same way that they would in an in-person environment (Hambley, 2007). To support the coordination of team's work and develop relationships with their subordinates, leaders navigating in virtual environments must use a special set of abilities, either with a single remote employee or a group of virtual team members (Bell *et al.,* 2019). Empirical studies have shown that distributed team leaders must invest a lot more time and effort to get their distributed teams to function similarly as in-person teams (Purvanova & Bono, 2009). Leaders of distributed teams need to devote significantly more time and energy to the interpersonal aspects of leadership than the operational ones (Purvanova & Bono, 2009). According to Gallup, the most effective remote leaders set clear goals and objectives, hold themselves and their team members accountable, provide opportunities for development and learning, and give relevant feedback (Robinson & Hickman, 2021). It does seem that to foster good communication between the distributed team members, the team leaders need to promote and host many types of virtual meetings in addition to establishing clear communication routines (Liao, 2017). One example could be a virtual coffee break or a non-formal virtual meeting where participants gather to exchange both work and non-work related information (Durst & Edvardsson, 2012).

Due to the geographical distance leaders cannot directly monitor their team members behaviours nor decipher their thoughts, feelings, moods, and behaviours. This is thought to be the largest obstacle when creating and maintaining interpersonal connections (Jawadi *et al.,* 2013). The lack of in person interaction creates additional difficulties in the utilisation of ones social skills. Interpersonal relations are still affected by the lack of in-person contact even when using interfaces

to overcome the geographical distance (Cortellazzo *et al.*, 2019). Leading distributed teams requires the leader to be acutely aware of both their own emotional condition and that of each individual team member. When leaders fail to recognise the emotional gap between themselves and their team members, they are at risk aggravating problems and extending any unpleasant effects (De Smet *et al.,* 2020). The dispersed setting makes it increasingly difficult for leaders to read the emotional state of their team members. Distributed virtual teams are often characterised by the absence of closeness and face-to-face interactions which makes leading much more difficult affecting in turn also employee engagement (Mutha & Srivastava, 2021).

To promote their subordinate involvement and participation, distributed leaders need to be skilled at encouraging and stimulating their teams. These qualities have become crucial for leaders to excel in (Wittmer & Hopkins, 2022). Without nonverbal clues, leaders and managers need to change their leadership and interaction style for situations with minimal social context. In a distributed work environment, leaders need to successfully navigate in a virtual setting by paying attention to signals from their team member for an effective collaboration. Leaders need to construct an environment of trust to build a unified work environment that spans across multiple time zones. Trust and leadership are intertwined (Macaulay, 2020). Macaulay (2020) asserts that trust is crucial for a successful working environment. When leaders promote honest and open communication, treat their workers fairly and with respect, value their work and provide their employees the freedom to make decisions, then all of this together may develop trust among their team members (Dirks & Ferrin, 2022; Bell & Kozlowski, 2002; Whitener, 2001). Thus, distributed leaders need to follow the latest evolution of virtual leadership and build upon their strategies to keep their projects and employees utilised and driven (D'Souza & Colarelli, 2010).

With the evolution to distributed working, leaders may be expected to involve subordinates into decision making processes which in turn increases their involvement. As a result, leaders are expected to embrace a more inclusive style of leadership (Schwarzmüller *et al.,* 2018). When one incorporates their subordinate opinions into daily decision making through shared communication, then their employees may feel more accountability for the tasks they are responsible for. Hence, less control-seeking conduct from leaders should be expected (Schwarzmüller *et al.*, 2018).

Distributed work requires an increased level of self-discipline and motivation which can be used as selection criteria for employing an employee into a distributed working environment (Hoch & Kozlowski (2014). The research done by Mutha & Srivastava, (2021) showed that leaders are

crucial to motivating distributed workers. Employees in distributed teams are positively influenced by and engaged by leadership activities with focus on influencing and generating trust between team members. The findings showed that trust impacts commitment and facilitates the connections between leadership and distributed workers. The research findings also showed that leaders play a crucial role in creating a stimulating workplace environment that maximises the potential of each worker. The Cortellazzo, Bruni and Zampieri (2019) stressed that creating a supportive and a safe environment for their workers is a crucial skill for a leader to have. This promotes teamwork and unity among the workers. Empowered workers feel appreciated and are more likely to recommend the company to potential applicants (Wilkinson, 1998).

Harrell *et al*. (2018) has written that the company Google conducted a research study called Project Oxygen in 2008 which based on their research defined 10 important behaviours that best managers should have (Table 3).

Table 3. Many important behaviours of an effective manager

Important behaviours
Is a good coach.
Empowers team and does not micromanage.
Creates an inclusive team environment, showing concern for success and well-being.
Is productive and results oriented.
Is a good communicator – listens and shares information.
Supports career development and discusses performance.
Has a clear vision and a strategy for the team.
Has key technical skills to help advise the team.
Collaborates across the organisation.
Is a strong decision maker.

Source: Google Project Oxygen (2008) effective leader model, compiled by the author

Table 3 provides a sufficient overview of personal qualities and important behaviours that a successful leader should have to support their team. Some research advises to support leadership roles with structural supports (e.g., Bell & Kozlowski, 2002; Hinds & Kiesler, 2002; Kahai *et al.,* 2003). As an example, a bonus system to support the leader or the employee eagerness to reach for higher results can be named (Kahai *et al*., 2003). Bell & Kozlowski (2002) suggested to share the

responsibilities of leadership with the distributed employees. This shared responsibility among distributed team members might also lead to increased inspiration and growth of these individuals (Kirkman *et al.,* 2004).

The main points presented in the literature review of this chapter emphasise the importance of structure and clarity in distributed working environments. The author has learned that distributed teams often face similar challenges as conventional or in-person teams. It is understood that distributed teams also require effective leaders who provide structure and direction together with frequent communication using the right channels. Further focus is to be provided by the organisation in overcoming cultural differences and to support with mechanisms when it comes to lack of in person communication. The author has not found any previous studies regarding distributed working in electrical engineering companies and hopes that this research is valuable in identifying and solving distributed working challenges within this type of engineering environments. The next chapter focuses on the research methodology.

2. METHODOLOGY

In this chapter the author presents the methodological approach used in this research. In the first section the author presents the research design while the second subchapter presents the sample groups and data collection methods. The third subchapter presents the data analysis methods.

2.1. Research design

This study used mixed methods design, which is a procedure for collecting, analysing and combining quantitative and qualitative data within a single study in order to recognise the research problem more intimately (Creswell *et al*., 2017). By combining the advantages of quantitative and qualitative methodologies, mixed methods research offers the chance to develop potentially more innovative viewpoints. In doing so, it overcomes the drawback of using either approach alone and provides a more integrated picture of findings from quantitative and qualitative components of mixed methods research (Creswell *et al*., 2017; Teddlie & Tashakkori, 2003).

The purpose of this sequential mixed methods study was to study the distributed teamwork challenges at HE GA Systems EOU and how to further manage the distributed factor of remote work. This approach did not only consider the feedback of the EOU distributed personnel, but it also considered what the functional leaders perceived of the current working environment and what they envisioned to happen in the future. Hence, this research focused on two empirical studies, executed one after the other, which both research the same research object but from a different methodological angle. As the author wished to portray the reality of the distributed working environment then it was decided to execute the research using a survey directed towards the EOU personnel to gain insights from the employees. Once the survey was completed, the functional leaders did get their chance to provide valuable insights and comments not only to the results of the survey but also about their plans for the EOU.

The methodological process of this research is visualised on Figure 1 below.

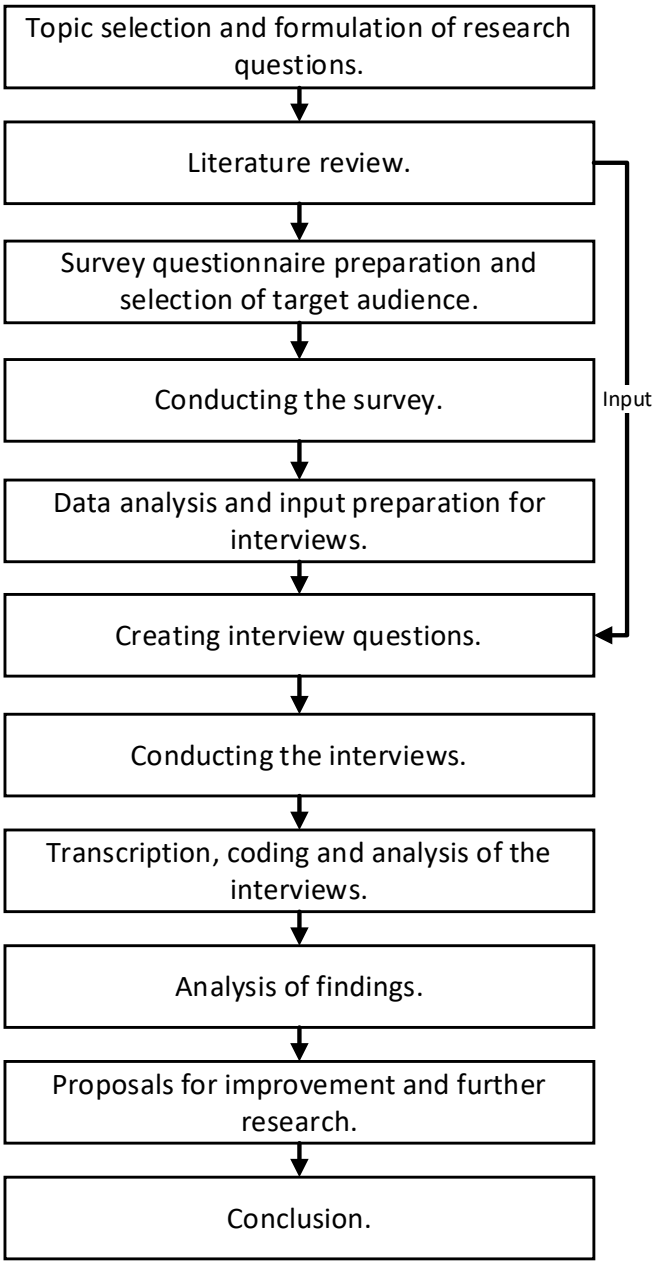

Figure 1. Methodological process of the research

Source: Constructed by the author

As described in Figure 1, the methodological process starts with the topic selection and formulation of the research questions. Followed by the literature review which provides ample input for the development of the quantitative survey questions and selection of the sample group. The survey tool will be an online questionnaire and once the survey is completed it is then followed by the data analysis. The survey provides further input to the development of the interview questions together with the results from the literature review. Once the interviews are completed,

the results are transcribed, coded and outcomes are analysed to find patterns or differences. That is followed by an analysis of the findings, proposals for improvement and suggestions for further research. The methodological process is finalised with conclusions of the research.

2.2. Sample groups and data collection

The following subchapters describe the sample groups for both quantitative and qualitative research and methods of data collection. As this master's thesis is based on a mixed methods approach, the empirical research consists of two research methods to obtain answers to the questions raised in the introduction chapter of this thesis.

2.2.1. Sample groups

Quantitative

In the quantitative research the entire population were the engineers who were employed by the EOU and who were all distributed over 16 countries in Europe. The sample group was formed by using the nonprobability sampling methods purposive sample method. The participants of the questionnaire were specifically chosen based on predetermined criteria (Õunapuu, 2014; Bell *et al*., 2022). The total population was 250 distributed team members, of whom six were functional managers and hence excluded from the group. Therefore, the sample group, as determined by the purposive sample method was 244 distributed team members.

Qualitative

In the qualitative research the sample group were the functional managers. The sample group was limited to six managers employed by HE GA Systems who oversee the activities in the EOU. The overall Operating Unit Engineering Manager was excluded from the study as he was not active in the daily operational tasks of the EOU. The six functional managers control and steer the direction of their respective functions which are the following:

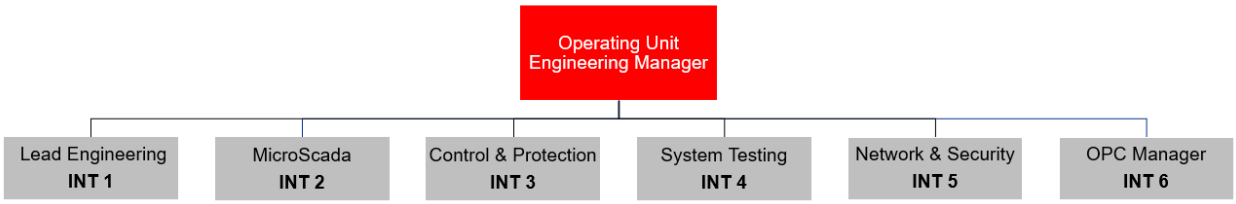

Figure 2. EOU functional managers

Source: Compiled by the author

All the functional managers have common characteristics which are:

- experience in a multicultural international engineering company;
- have at least a decade of experience within the company and in the power engineering industry;
- leading a distributed workforce employed by the HE Energy Systems EOU organisation in different countries;
- each one leads a team of 6-90 people;
- are all based in Europe, namely Czech Republic, Finland, Germany and Switzerland.

2.2.1. Data collection

Quantitative

The questionnaire was anonymous. The majority of the 55 questions were already used in the previous studies and the sources of these questions are provided in Appendix 2. The first two questions were developed by the author to establish the location of the team members and their managers. It was not permitted to request any more personal information that would identify the team members due to constraints set by the hosting organisation and consulted unions. The remaining 53 closed ended questions have a range of predefined answers which used the Likert 5-point scale (Sreejesh *et al*., 2014). 38 of the questions are from the survey created by Lurey & Raisinghani (2001) and 18 of them were modified by the author to fit into the context of the EOU and this research. Lurey & Raisinghani (2001) study contained a larger collection of questions which were excluded as they were not needed for the scope of this research. The remaining 15 questions were developed by the author together with the company assigned thesis supervisor. The quantitative study survey questionnaire can be found in Appendix 1.

The first two questions use a nominal scale with a list of choices using a drop-down list. The 53 Likert scale questions have answers as text values, thus after receiving the results from the

quantitative research the data is recorded in numeric values. The Likert scale has been assigned the following values as described in Table 4 to perform descriptive analysis of the questionnaire results.

Table 4. Likert scale as per Joshi *et al*. (2015)

Likert scale	**No**
Strongly agree	5
Agree	4
Neutral	3
Disagree	2
Strongly disagree	1

Source: Compiled by the author

Due to the population, namely the 250 engineers employed by the EOU, the author opted to use quantitative research method to analyse the distributed work environment including the experience with the current distributed leadership. The instrument for data collection was an online questionnaire. The survey was sent to the 244 distributed members in the EOU except the six functional managers who were interviewed later in the qualitative part of the study. The author decided to use Google Forms which uses Google Drive storage system as the environment where the survey document is stored. The questionnaire was sent out on 27th of February and the participants had the chance to reply until 17th of March 2023. A total of 110 engineers responded to the survey which meant that the participation rate was 45%.

As per the request of the HE GA Systems EOU the survey questions were categorised into variable groups as following: 1) 2 questions on location, 2) 11 questions on communication, 3) 17 questions on collaboration, 4) 25 questions on leadership.

Qualitative

The author of this thesis opted for using semi-structured interviews for gathering additional data from the six functional managers to gain a better understanding of the research topic and to get feedback to the results from the quantitative research. Interview questions were developed together with the company assigned thesis supervisor using available literature and complimented with the findings from the survey. The semi-structured interviews with open ended questions gave enough room for the participants to provide ones views accordingly.

The interview consisted of 12 questions (Appendix 4) that have the following categories: 1) team member location in EOU, 2) distributed work challenges at EOU, 3) distributed leadership requirements.

The interviews were conducted on the 20th of March and on the 27th of March 2023 and held over Microsoft Teams (MS Teams). English language was used. Interviews had a time limit of 60 minutes however the average interview lasted around 30 minutes. The interview answers were recorded and for transcription the author used Trint software. The transcribed interviews were uploaded into Google Drive (Appendix 5). The six functional managers were explained the reason behind the research and were asked for permission to be recorded with the condition that recordings of the interviews would be deleted once the transcripts are completed and finalised. All functional managers agreed to participate in the research and gave their consent for their names and job titles to be used in the study. The recorded video and audio files were not allowed to be made public due to the company policy and have been deleted as of 9th of May 2023.

2.3. Data analysis

This research is looking for the most prevalent communication and collaboration challenges within the EOU. The source data is either the quantitative survey results, the qualitative interview results or the combination of both. Where applicable the author has combined or checked the qualitative results against the quantitative results.

Quantitative

For the data analysis, the author used Google Spreadsheets to visualise the replies for the first two questions. The author used MS Excel to visualise the replies for the remaining 53 questions.

The author used data analysis, with the methods of descriptive statistics:

1. arithmetic mean (M) scores and standard deviation (σ);
2. frequency table analysis based on low scoring (disagree and strongly disagree).

It was decided by the author and the company assigned thesis supervisor to use arithmetic mean to present the mean score for the respective question and for the category of questions. It was also

decided that the mean scores of the questionnaire results can be interpreted as good if the mean is greater than 4 ($M > 4$), satisfactory if the mean is between 3 – 3,99 ($3 < M < 3,99$) and low if the result is lower than 2,99 ($M < 2,99$).

To help to further interpret the data, frequency table analysis was used to further analyse the dissatisfaction level by analysing the frequency of negative responses for each question and the average frequency of negative responses per category (disagree and strongly disagree).

Qualitative

The method of data analysis was content analysis which focuses on the interview results hence the content of the transcripts. The qualitative content is analysed by the author following the four steps described by Mojtaba *et al*. (2016):

1. Initialisation- the author reviewed the transcripts sentence by sentence to discover relevant data and prepared them for coding by highlighting any relevant information; the author looked for patterns in the highlighted information.
2. Constructing- the author constructed themes combining the patterns found using coding; the author defined the themes.
3. Rectification- the author reviewed and related the themes to established knowledge.
4. Finalisation- the author developed the story line.

The abbreviation INT is used in the analysis part instead of the names of the interviewees to improve the readability. The conclusion based on the collected data is the final step of the research. Microsoft Excel was used to organise the interview findings (see Appendix 5).

3. RESEARCH RESULTS

In this chapter the findings of both studies are presented. Interview results are presented in coded form, namely INT1, INT2, IN3, INT4, INT5 and INT6. To complement the qualitative study results, quantitative analysis of each category (communication, collaboration and leadership) is done by reviewing the arithmetic mean scores and frequency table analysis based on average low scoring (disagree and strongly disagree) to further visualise the data.

More precisely, this chapter is organised as follows. Subchapter 3.1 designates the team and their respective managers locations, subchapter 3.2 defines the quantitative results of each category, subchapter 3.3 describes the communication and collaboration challenges in the EOU, subchapter 3.4 summarises the distributed leadership requirements in the EOU. The final subchapter 3.5 provides proposals for improvement.

3.1. Location of the EOU distributed teams

To gain knowledge on the location of the EOU personnel, the survey had two introductory questions to analyse the location of the survey participants and their managers location. The survey participants were based in 15 countries across Europe and the number of participants from each country can be seen on Figure 3 below.

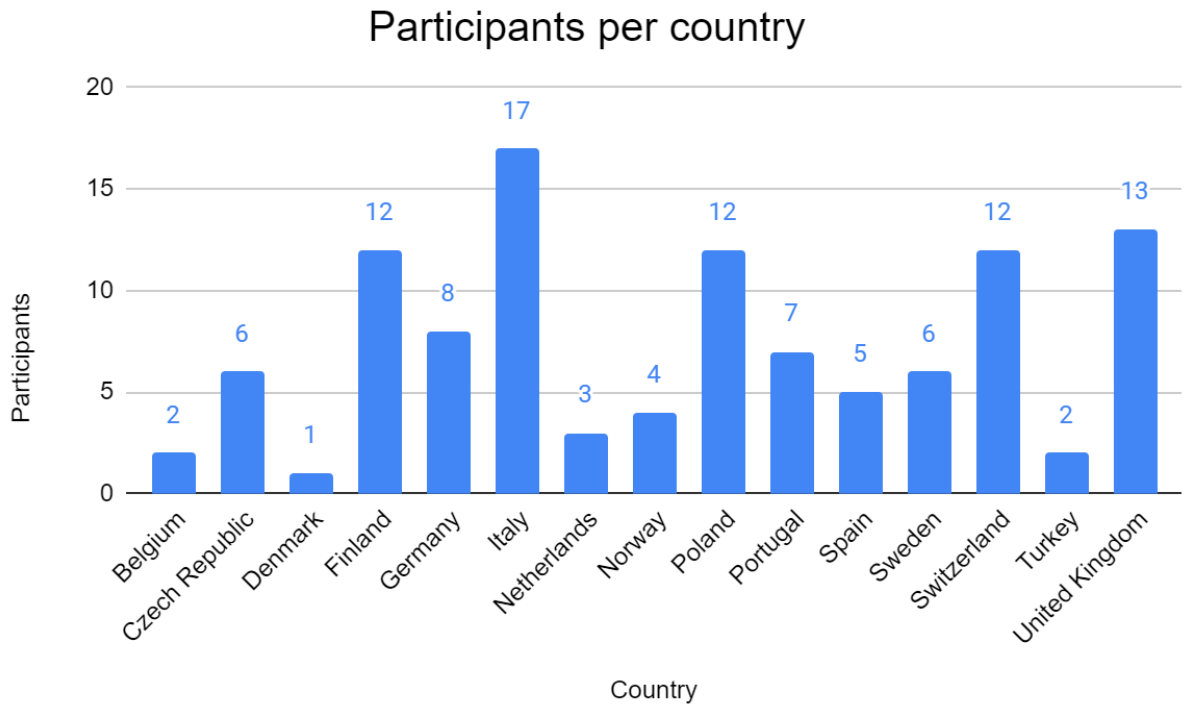

Figure 3. Participants per country

Source: Compiled by the author

As seen in Figure 3, the majority of the survey participants are based in Finland, Italy, Poland, Switzerland and United Kingdom. The smallest number of responders who participated are based in Belgium, Denmark and Turkey where the EOU have the smallest teams. Out of 16 countries 15 participated except for team members from France.

To have a better overview of the location of the teams that report directly to the respective functional manager the author requested the interviewee to list the countries their teams are located. The team locations per functional manager is listed below:

- INT1 (MicroScada Engineering): Belgium, Denmark, Finland, Germany, Italy, Portugal, Netherlands, Norway, Sweden, Switzerland and United Kingdom. The team is roughly 80-90 people.
- INT2 (Lead Engineering): Finland, France, Germany, Italy, Portugal, Spain, Sweden, Switzerland, Turkey and United Kingdom. The team is 52 people.
- INT3 (Control and Protection): Finland, Germany, Italy, Norway, Poland, Portugal, Sweden, Switzerland and United Kingdom. The team is roughly 60- 70 employees.

- INT4 (Network and Security): Finland, Italy, Norway, Sweden, Switzerland and United Kingdom. The team is 6 people.
- INT5 (System Testing): Czech Republic, Italy, Switzerland and United Kingdom. The team is 30 people.
- INT6 (OPC Manager): Czech Republic. The team is 50 people.

In total, the six functional managers managed teams in 16 countries and the total workforce is between 278 to 298 people. The author used company internal team graphs to select the survey population and the total number of employees identified at that time was 250 people including the functional managers. The author believes the difference in number of employees is caused because some of the extra employees are hosted by the functional manager in the country, however, they do not directly report to them. In some countries the local rules and regulations require one manager to be based in the country while their own functional line manager may be located in another country. It has also been noted in the interview that when functional managers counted their team members, the functional managers with larger teams were vague with the exact number of people who report to them.

To determine the location of the questionnaire responder's manager, three options were given: in country, different country or in the same country but in a different location. The distribution between countries can be seen further in Figure 4 below.

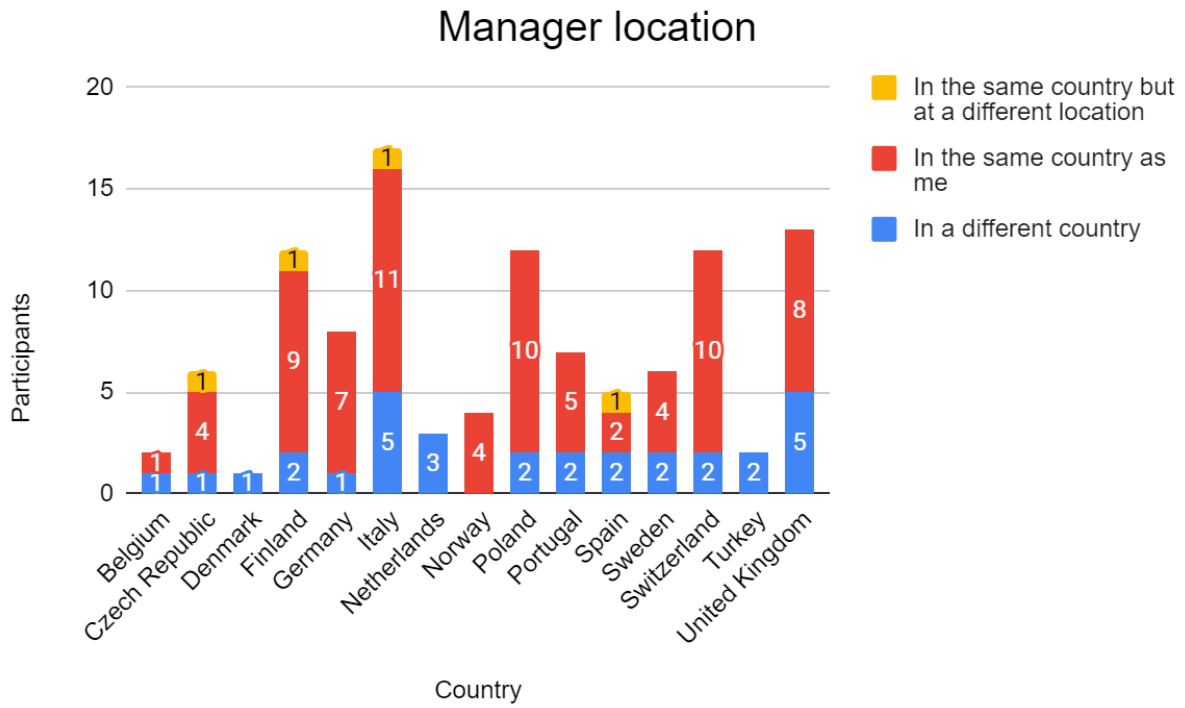

Figure 4. Manager location of survey participants across countries

Source: Compiled by the author

As seen in Figure 4, 75 survey participants had their managers based in country which means that their managers are based out of the same main office. 31 survey participants had managers based in another country and 4 participants had their manager based in the same country however in a different office.

3.2. Quantitative results for each category

The author analysed the arithmetic means in Figure 5 for each questionnaire category in order to visualise the results and to support the later analysis of the qualitative data.

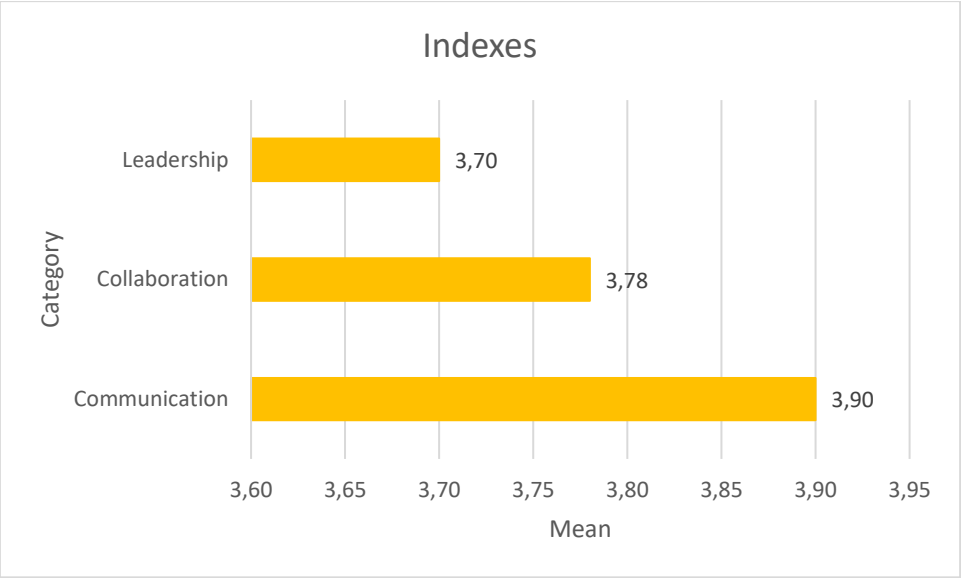

Figure 5. Arithmetic mean scores, results per category

Source: Compiled by the author

As seen in Figure 5, out of the 3 categories, average of the means is calculated with the highest score in communication with 3,90 respectively, second highest in collaboration with 3,78 and the lowest score is reached in leadership with 3,70 respectively. All three results give a satisfactory result.

The average frequency of negative answers per category is further visualised in Figure 6.

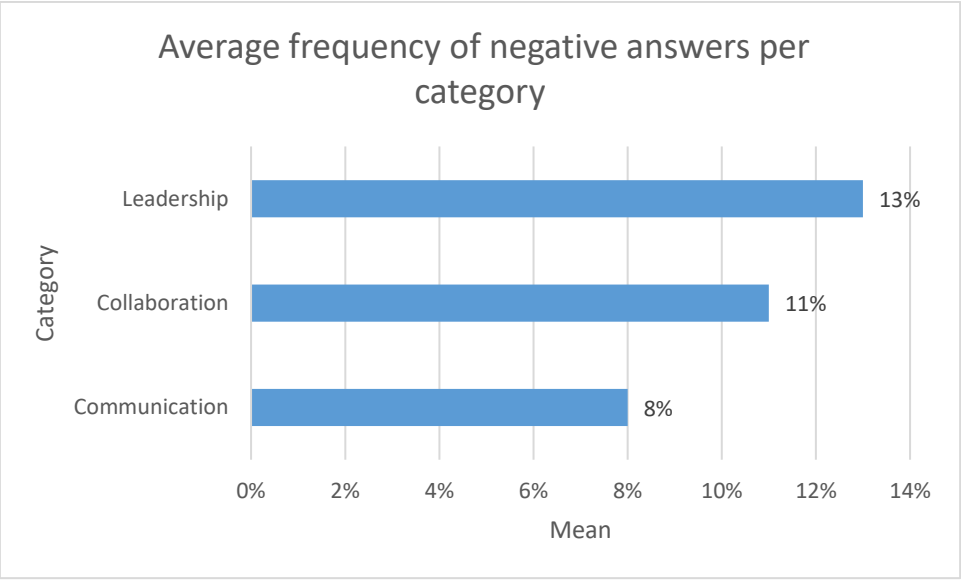

Figure 6. Average frequency of negative responses per category

Source: Compiled by the author

As seen on Figure 6, the greatest frequency of negative responses is found in the category Leadership (N= 14,64; cumulative percent 13%) and lowest in category Communication (N= 8,55; cumulative percent 8%).

The author has also analysed the frequency of negative answers for each question, which is available in the Appendix 6.
In the following section the author presents the results of the interviews which were complimented with findings from the questionnaire.

3.3. Collaboration and communication challenges in the EOU

The author asked the interview participants what are the main challenges when it comes to distributed working in the EOU and how do they support collaboration and communication within their functional areas. Based on the interview findings, nine main challenges were identified.

3.3.1. Lack of in-person communication

After combining the survey and interview data the author learned that there is a possible improvement area in focusing on the lack of in-person communication within the EOU that might benefit collaboration and communication. As mentioned by INT4: “It is interesting that I have team for a year and a half now and out of my six members, I saw two of them face to face so far. All the others I just know from MS Teams calls.” Furthermore, INT4 added: “If you know them personally then it is easier to work remotely.” INT2: “We noticed that it is good if you start working together if you have already met once personally in a relaxed surrounding. This gives a good basis for future remote working ant this could be more emphasised.” The author interpreted the answers as a possible improvement area. On that matter, the survey findings suggest a similar improvement opportunity.

Table 5. Mean scores for in-person communication

No	Question	Mean score	σ
8	Team members are in contact with one another on a regular basis for social, or non-business, purposes (during work hours, example virtual coffee break).	3,31	1,07
15	The team has regular virtual meetings dedicated to foster social relations.	3,40	1,06
17	I had the opportunity to meet all my team members in person when I started.	3,75	1,28

Source: Compiled by the author

As seen in Table 5, the survey question 17 asked if the team members have had the opportunity to meet each other in person, and based on the results the author calculated the mean value on the satisfactory level of 3,75 visualised in Table 5 however the cumulative frequency of negative answers as presented in Appendix 6 was 20% (N= 22) which is rather high. Furthermore, the replies to question 15 where the members were asked if they have regular virtual meetings dedicated to foster social relations, suggest a similar conclusion. The mean score was 3,40 (3 < M < 3,99= Satisfactory) and the cumulative percent of negative answers was also relatively high at 21% (N= 23) as listed for question 15 in Appendix 6. In addition, the replies to question 8, which asked if the team members are in contact with one another on a regular basis for social, or non-business purposes, was rated with a mean score of 3,31 (3 < M < 3,99= Satisfactory) and the cumulative percent of negative answers was 26% (N= 29) as listed in Appendix 6. The author interprets the combined findings that while communicating over distance using ICT tools, one may improve collaboration and cooperation when they have met the team in person. In addition, the author would propose to organise regular virtual social meetings to foster communication between team members in order to build social bonds. The interviewed functional managers all seemed to agree with the research done by Hoch & Kozlowski (2014) that forming interpersonal relationships over virtual channels is difficult.

3.3.2. Geographical distance

The author learned that not only the geographical distance is an issue when working in a distributed manner but there is also distance to understanding local markets, which often results in difficulties in leading them. INT4: “In terms of resourcing coming projects you need to understand the local market. That is a bit difficult to do remotely.” This was further confirmed by INT3: “It is difficult to support people in the local markets in terms of operations.” INT1: “The biggest challenges for this kind of distributed team are that local conditions are very different.” This would imply that

the remote leader would have difficulties understanding the local rules and regulations from a distance. It also implies that information sharing with regards to the activities in local markets are not sufficient and it does not reach the functional level managers.

Table 6. Mean scores for local manager competence

No	Question	Mean score	σ
47	My manager understands the local market where me and my team operates in.	3,96	0,98
48	My manager knows my strengths and weaknesses in order to assign me manageable projects.	3,98	0,98
49	My manager knows the local processes and is connected to the relevant stakeholders in order to support my work.	3,87	0,95

Source: Compiled by the author

As seen on Table 6, this conclusion seems to be supported by the results from the survey as the EOU distributed employees rated their managers understanding of the local activities as satisfactory. The author interprets the results as following, while the functional managers might not have a sufficient overview of the local markets, their local team leaders might have a better overview of the local market needs and their resources. On that matter, the survey results presented in Figure 4 showed that 72% (N= 79) of the survey responders team managers are based in the country. 28% (N= 31) of the survey responders have a manager located in another country which may be the cause for the satisfactory result of the mean score. The frequency table analysis supports the interpretation for question 47 and 48 as the cumulative percent of negative answers for both is 8% (N= 9) and for question 49 the cumulative percent of negative answers is 7% (N= 8) as per Appendix 6. The results seem to be in line with research done by Hoch & Kozlowski (2014).

3.3.3. Cultural differences

Distance to the local cultures and markets have been emphasised by several functional managers. According to INT1, the biggest challenge has been to understand the different cultures. This person stated: “It is totally different in different countries. We have countries like Portugal, Italy, Norway, Finland, Switzerland and United Kingdom. There are different kind of culture behind every line manager”. INT3 tailored his communication style based on the receiver and their cultural background and mentioned: “Sometimes there are cultural backgrounds that you need to know that one country is communicating more directly, the other one is more fluid.” While none of the

interviewees have received any cultural training, they considered on the job training to be sufficient. The interviewees seem to agree with Leung & Wand (2015) that although cultural differences are seen to enrich the knowledge and viewpoint, norm discrepancies can lead to misunderstanding and other intercultural problems.

The author interpreted the results from the interviews as following- developing an understanding of the local markets and cultures is developed over a period of time and one learns to adjust their communication style to deliver their message. The results from the survey showed that the EOU distributed employees considered their teams aware of the risk of online communication including understanding cultural differences. They rated the risks for online communication problems with a mean score of 3,9 (3 < M < 3,99= Satisfactory) and the cumulative percent of negative answers was only 3% (N= 3) as listed for question 10 in Appendix 6. This may be explained by the fact that the company is multicultural and operates in global markets exposing their employees regularly to different cultures. However, in order to further enhance the existing employees and any new hires to improve their understanding of different cultures and communication styles, based on authors opinion after reviewing the data, the company should invest into relevant courses.

3.3.4. Load and capacity planning

The author learned during the interviews that with geographical distance and when working in a distributed environment across countries, the visibility over the local markets and the supervision of people can be cumbersome. On that matter, INT6 mentioned: “I think one of the biggest challenges I have is supervision of people, what are they really doing?” While INT5 said: “My team itself is also completely remote, so nobody is in the same country from my team and it is difficult to see what they are working on.” The interviewees agreed with Peters *et al.* (2016) that monitoring who is working remotely and when they are working is difficult.

The author further learned that with the lack of supervision, it was also difficult to estimate the effort which one should take to complete a particular task as mentioned by INT2: “It is also difficult to estimate the current load of the people. Are they fully loaded and if they have no time to do anything else. This is not possible to observe from remote.” In a similar vein INT4: “To get a little bit of a feeling about the workloads, that is difficult.” Based on the interview results, one functional manager did suggest a possible solution for this matter which is the following, INT2: “To improve control and overview of what the employees are working on, I would suggest a tool to collect the load across all countries. The quality of this tool depends on the self-assessment of the people, how they are loaded and estimations, how much work it is.”

3.3.5. Wellbeing and inclusion

The author learned that it is difficult to understand the mood and stress levels of the distributed team members when working remotely. INT2 stated: “Biggest challenge, I feel, is to notice the mood of the team members. Because in the office you hear it in the voice while talking. You go through the office and then you see how the body language is in front of you. Remotely it is not possible.” On that matter INT4 mentioned: “How is their mood. Distance makes things a little bit difficult and it is quite complicated to get a feeling for that.” In addition to reading the people, several functional managers mentioned that the organisation is still new and their employees do not have the experience of working remotely and the experience with remote managers. INT3: “The organisation, it’s rather new. It is important not to be perceived as someone sitting elsewhere and deciding on things that is not only impacting our business but also our daily work.” INT3 added further: “I think that is rather a big challenge to become as an integral part although working remotely but as you would be based locally and in the country.” The findings suggest that to lead a distributed team one needs not only to master social techniques but also to become proficient in a range of virtual communication practices as described in Roman *et al.* (2019).

The author learned that although interviewees were cautious to communicate any successes within the EOU, when it came to wellbeing and inclusion, the survey question results seem to show that there is respect for each team member and that the team leaders do value their team member’s input. The results also indicate that more could be done to improve team morale and bring individuals closer to decision-making as further visualised in Table 7 below.

Table 7. Mean scores for team morale and inclusion

No	Question	Mean score	σ
24	Individuals are encouraged to take initiative and participate in important decisions.	3,75	0,93
25	Team member morale is high in the team.	3,71	0,91
26	There is respect for each individual in the team.	4,40	0,75
27	I feel my input is valued by the members of the team.	4,07	0,82
36	My team leader values my input.	4,09	0,94

Source: Compiled by the author

As described in Table 7, the mean scores for the above-mentioned questions were mostly on the good level with the exception of question 24 and 25 which resulted in a satisfactory mean score of 3,75 and 3,71 respectively. The cumulative percent of negative answers was 8% (N= 9) for both

questions 24 and 25, 2% (N= 2) for question 26, 4% (N= 4) for question 27 and 6% (N= 7) for question 36 as described in Appendix 6.

The author learned from the interviews that much concern was raised around the feeling of loneliness and wellbeing within the EOU. INT2: “The personal relations are very reduced. So, you do not feel like a member of the group or of a crowd working together. You feel sometimes quite alone.” This was further confirmed by INT3: “The biggest challenge is to have the feeling how the people are, how can I perceive in the best way that the people are doing well or if people are struggling. That compared to local working is different as you see people from time to time in the coffee corner.” INT6: “One difficulty is losing social contact among people when the remote work is taking a long time.” In the post pandemic era INT6 mentioned that even after the normalisation of office and distributed work that “some people are still not fully connected from a social point of view.” The findings seem to be in line with Miyake *et al.* (2022) that long term distributed working might lead to reduced social contact and loneliness.

The author learned that the phenomena of coffee corner discussions, which often result in small talk and potential information sharing around certain topics, were mentioned as a missing piece in todays distributed working within the EOU. INT5: “Discussing small points in a coffee corner is missing, it is definitely a different way of communication.” INT4 mentioned that “you need to establish common meetings together in a regular way as you cannot meet people in the coffee corner like you did when working together.” Thus, the finding seems to be in line with previous research done by Durst & Edvardsson (2012).

3.3.6. Strategy and vision

After combining the qualitative and quantitative data the author has learned that the EOU could improve the communication and collaboration within the unit by focusing to improve the communication of strategy and vision. The quantitative data that prompted this conclusion is shown in Table 8.

Table 8. Mean scores for strategy and vision

No	Question	Mean score	σ
33	The organisation's leaders have created a vision and strategy for the EOU.	3,36	0,99
34	This vision is articulated to all members in the Operating Unit.	3,25	0,96
35	The management approach in our organisation promotes initiative in team members.	3,35	1,03

Source: Compiled by the author

As described in Table 8, the mean scores for the above-mentioned questions were on the satisfactory level however the cumulative percent of negative answers as presented in Appendix 6 were rather high 18% (N= 20), 20% (N= 22) and 17% (N= 19) respectively. This suggests a relatively high percentage of dissatisfaction when it comes to the communication of the EOU strategy and vision. This issue was further studied in the interviews. INT1, INT2 and INT3 indicated that the EOU could perform better when it comes to communicating their strategy and vision set by their management. INT1: "The whole operating unit is not doing very well with information sharing about strategy." INT2: "This is maybe not the best." INT3: "To be honest, we can do better." However, the author learned that there was one functional manager who did take initiative to communicate vision and strategy in his own respective functional area. INT2: "In the lead engineering I try to communicate this via the landing page (SharePoint page) and I have made workshops where we meet personally and distribute information and the direction I would like to have in my functional area." Beyond the interviews with the functional managers, the author learned that the interviewees do communicate management strategy and vision however they do that by distributing emails and in meetings. Although all interviewees indicated that they share information from top management in their weekly or monthly meetings, the results suggest that the exact communication approach in this regard still needs to be found.

3.3.7. Employee onboarding

The author has learned from the interviews that the majority of the interviewees followed a structure to onboard new hires with some citing on the job trainings, mentorships and specific technical courses that were organised within the EOU (e.g., INT1, INT2, INT4, INT5 and INT6). As mentioned by the INT1: "Very important is the participation in some practical customer project where the engineer has to work under supervision of a mentor. This mentor is nominated from the team and is usually an experienced engineer." INT6: "We have such a program called the adaptation program, which is normally for the SCADA engineer, and it is one year long. There is

a list of topics which should be covered and it also mentions people who should support these parts."

A number of interviewees, e.g. INT1, INT2 and INT6, agreed on the importance of technical trainings and some already had a practise to send their employees to technical courses. INT1: "We have an extremely easy situation because the MicroScada University is located here in Finland, it is very easy to put them into the trainings." However, during the interviews the author discovered that the internal company trainings are very expensive even for the company's own employees. INT1: "Unfortunately the training prices are very expensive. The training day can cost up to 1000 €." The author presumes that due to the expensive cost of the training the EOU engineers might not be exposed to the latest technology and practices due to budget constraints.

The author has learned from the survey that there is room for improvement with bringing new team members up to speed and to improve their skills and competences.

Table 9. Mean scores for onboarding activities

No	Question	Mean score	σ
5	New team members are quickly brought up to speed when they join the team.	3,51	0,89
6	The team is equipped with the necessary skills and competence to work as a team.	3,93	0,81
12	I have received sufficient training from the organisation to develop my core technical and teamwork skills.	3,35	0,99
13	Team members have received training focused on becoming more effective regarding teamwork in the virtual team setting.	3,06	0,96

Source: Compiled by the author

As shown in Table 9, for questions 5 and 6 the mean score was only satisfactory, 3,51 and 3,93 respectively. Frequency of negative answers for question 5 and 6 were 10% (N= 11) and 5% (N= 5) respectively as presented in Appendix 6. This would imply that potentially onboarding processes are not as efficient as the functional managers believe. This conclusion is consistent with the results for questions 12 and 13 in the same Table 9 about receiving sufficient technical and virtual teamwork trainings with mean scores of 3,35 and 3,06 respectively with frequency of negative answers was 19% (N= 21) and 29% (N= 32) as presented in Appendix 6. This implies that the

leaders in the EOU should place more emphasis on the onboarding activities including internal technical and virtual teamwork trainings.

3.3.8. Knowledge sharing

The author learned that the functional managers seemed to agree that the common meetings and information sharing sessions, where team members share their experiences and best practices, benefit the knowledge sharing in the EOU. INT1, for example, reported: “One country team could make a short presentation how a project has been run and then present it to the rest of the teams in our monthly meetings.” INT3: “This is something I do in my weekly meetings.” INT1: “These 1 to 1 and monthly meetings are probably the most important format for information and knowledge sharing.” In addition, INT4 added: “We do monthly trainings about cyber security, somebody out of my team is giving a training on a specific topic to the whole engineering community via MS Teams.” All the interviewees seemed to agree with Navimipour & Charband (2016) that knowledge sharing is an integral part of their organisation.

All the interviewees use a SharePoint site to share documentation, best practise and know-how to their distributed team members. In addition, INT1, INT3 and INT5 share know-how through regular 1 to 1 meeting. Everyone except INT6 confirmed that they try to connect their team members to members in the EOU who have the required knowledge to support them. As stated by INT3: “When I get feedback from someone requesting a specific knowledge then I try to connect them with the experts and this is also something we do remotely.”

Table 10. Mean scores for knowledge sharing

No	Question	Mean score	σ
7	Team members are in contact with one another on a regular basis in order to conduct routine business.	3,95	0,85
14	I feel that my skills and competences are sufficient to perform my work.	4,11	0,73
19	I rely upon other team members to complete my assigned work.	3,49	0,97

Source: Compiled by the author

As shown in Table 10, the conclusions from the interviews are further supported by the questionnaire result for question 14 where the team members stated that they have the required skills and competences to perform their work. Question 14 came in with a mean score of 4,11 and frequency of negative answer at 2% (N= 2) as presented in Appendix 6. However, the author learned that although the interviewees supported knowledge sharing, replies from the

questionnaire for questions 7 and 19 in Table 10 resulted with a mean score of 3,95 and 3,49 respectively. The frequency of negative answers was 6% (N= 7) and 17% (N= 19) as presented in Appendix 6. The results indicate that communication between the team members might be lacking and needs further support. The author has also learned that the EOU employees are often individual contributors and work independently on tasks and assignments. In this regard INT5 statement can be mentioned: "Additional problem is that my team does not fully work together in projects, they are individual contributors."

3.3.9. Reward and incentives

The author investigated how the EOU celebrates success and if there is a reward system for teams or individuals performing their work successfully.

Table 11. Mean scores for reward

No	Question	Mean score	σ
50	The team celebrates its successes.	3,05	1,13
51	I am rewarded individually for my work efforts.	2,84	1,19
52	All team members are rewarded when the team reaches its goals.	2,82	1,04
53	My manager makes it clear what rewards one can expect to receive when performance goals are achieved.	2,85	1,17

Source: Compiled by the author

The Table 11 presented the EOU questionnaire results with low mean scores for the questions related to reward and satisfactory result for the question related to celebrating success.

The frequency table analysis, as presented in Appendix 6, shows a score of 34% (N= 37) for question 50, 38% (N= 42) for question 51, 33% (N= 36) for question 52 and the score of 35% (N= 39) for question 53. The author has learned from the findings that there is room for improvement with satisfying a relatively large percentage of the EOU that might be dissatisfied with the low levels of rewards and incentives.

This matter was further investigated in the interviews. When questioned about the practices in the EOU majority of functional managers did not have a clear overview of best practices in the EOU. INT1: "We do not have a common way for reward but there are different local ways." INT2: "Some countries have it, but I guess not so much. Across countries I don't know." INT3: "There is no formula for rewarding or highlighting at the moment." As interpreted by the replies of the interviewees, there are no possibilities for cross country bonuses however in some countries there

are possibilities to provide a small one-time incentive. INT1: “In Finland we have a so-called instant reward where a line manager can make a decision to give an award, it’s normally a small amount. This you can get for example after good feedback from a customer.” INT3: “There is a local process in Switzerland which we use for appreciation. This is a onetime payment that you can do once a year where you fill in a form and the employee receives a small incentive.” All interviewees seemed to agree that focusing more on rewards is a possible improvement area thus the finding seems to be in line with previous research by Bell Kozlowski (2002), Hinds & Kiesler (2002) and Kahai *et al*. *(*2003) stressing that a potential bonus system should support the leader and the employee eagerness to reach for higher results.

The author interpreted this finding as following, based on the quantitative data it seems the employees of the EOU may be dissatisfied with the lack of incentives when performing their job well. Furthermore, the finding suggests that the functional managers do not have a common way of providing incentives to their team leaders nor to their employees. The findings from the interviews in this regard left the impression that these one-time bonuses were considered rather an exception than a common practise.

As question 50 resulted with a mean score on the lower level of satisfactory the author decided to investigate this result further with the interviewees when it came to celebrating success within the EOU. Consequently, the author asked how their teams celebrate when they meet the expected results. INT1 reported that “We highlight these successes in our functional meetings” while INT3 mentioned that “At the moment we only collect highlights in our teams and share them in our organisation.” All interviewees mentioned that if a team has performed well in a project, they normally send them a congratulatory email. Some functional managers contact the respective employees directly, for example, INT4 stated that “I tell them personally that they did good work” and INT5 said “I do that in the personal way.” Only INT6 who is responsible for the team in Czech Republic mentioned that they organise celebratory presentations followed by some candy and cake. Based on the findings it can be concluded that providing positive feedback to a job well done would further improve the collaboration and communication between the team members of the EOU.

Based on the findings, the author has identified the main challenges in the areas of collaboration and communication that are prevalent at the EOU:

- lack of in-person communication affects daily operations of the team members;
- geographical distance impacts understanding of activities in the market;

- inattention on cultural awareness affecting understanding between team members;
- no load and capacity planning impacting effort visibility;
- difficulties in sensing employee wellbeing and inclusion from a distance;
- communication of strategy and vision is inadequate;
- shortage of structured onboarding activities for the local markets;
- knowledge sharing between distributed teams is insufficient;
- no reward and incentives affecting employee enthusiasm.

3.4. Distributed leadership best practices in the EOU

The author collected the leadership best practices based on the interviews when it comes to distributed working in the EOU. Based on the interview findings, six main themes were constructed.

3.4.1. Leadership availability

It was found that all interview participants occasionally struggled with the distributed working style and were willing to communicate their own challenges with it. For example, INT1 and INT2 mentioned management availability as one of the problems with distributed working. INT1: “I have been in all kinds of line management positions for 23 years, so I have been quite independent for a long time. My personal line manager is very busy and it is practically impossible to just call him and ask something.” In the same vein, INT2 reported that “The challenge is that you cannot approach your manager so easily by walking to his desk. You can’t notice if he is in a good mood, how stressed he is and how open he would be for small talk or for a fast decision.”

As discussed in the previous subchapter, the lack of in-person contact affects daily operations negatively and in the case of leadership it affects decision making speed; an issue that was further stressed by INT1: “When working remotely, you have to ask if you have five minutes.” Interviewees said that it is difficult to get fast decision from their manager when working remotely. And INT5 declared that: “You have to get in touch with your manager to clarify things over MS Teams as you cannot just walk to him nearby.”

Table 12. Mean scores on availability of leaders

No	Question	Mean score	σ
29	The team's leaders are friendly and can be easily approached.	4,35	0,89
30	Team members feel that the team's leaders are helpful and supportive.	4,15	0,89
41	My manager is always available when one needs help.	4,36	0,78

Source: Compiled by the author

The findings obtained suggest that there are differences regarding the topic of availability between the qualitative and quantitative data (Table 12).

The functional managers report to a management level which, as understood from the interviewees, is very busy and often not immediately available. Consequently, this negatively affects the decision-making speed. However, the questionnaire results suggest there are differences in the leadership availability and it seems that both the functional managers and their respective team leads are available to the EOU employees as according to Table 12 the results for the questions 29, 30 and 41 are at a good level. The frequency table analysis shows a relatively low level of negative answers, for question 29 and 30 the cumulative percent of negative answers is 5% (N= 5) and for question 41 the cumulative percent of negative answers is 4% (N= 4) as per Appendix 6. It seems that the functional managers are more involved in their respective functions and foster communication and collaboration by investing time and effort into regular 1 to 1 meeting where the employee or the team leader may ask for support if needed in addition to the general information sharing meetings. It seems that the findings are in line with the previous research done by Wittmer & Hopkins, (2022) who mentioned the need for more virtual connections between the manager and the employee.

3.4.2. Team relations

The quantitative findings indicated that there is room for improvement when it comes to creating closer relations between the team members within the EOU. This topic was also discussed during the interviews and the functional managers addressed this matter as follows. INT5 suggested: "One possibility is to also create a closer relation to organise a meeting physically together from time to time. I also try to travel up to the teams and to meet them. To understand every country and spend time together. And to have a better feeling how they feel." In the study, the author discovered that there has been a number of obstacles to organise a travel as the trips have to be approved by the

highest-level managers who often do not have a sufficient overview of the situation within the EOU. As stated by INT3: “In our functional manager team meetings we frequently discuss on how to travel to meet our people. Unfortunately, our company often questions the purpose of travel even when we try to go and meet our own teams.” This situation has been addressed by INT3 who shared information about the need of travel to meet the team members and creating understanding within the management team.

Table 13. Mean scores for in person meetings

No	Question	Mean score	σ
17	I had the opportunity to meet all my team members in person when I started.	3,75	1,28

Source: Compiled by the author

In this regard, as per the Table 13 question 17, it seems that not all team members have met each other which might inhibit positive team relations. The author and the company assigned thesis supervisor expected the result for question 17 and provide further clarification as the majority of the team members have worked for the company prior to the pandemic-imposed restrictions and the distributed working model. The cumulative percent of negative answers was 20% (N= 22) as per Appendix 6. The high number of negative answers may be explained by the number of recent hires who have not met their team members when working from a distance. Face-to-face meetings between team members seem to be useful to foster cooperation and bring people closer together. In this regard, the organisation should further support functional managers and team members within the EOU to travel between countries.

The interview participants agreed that meeting one another prior to starting to work together in a team is important. As stated by INT2: “We noticed that it is good when you have met the person already before starting to work remotely together. That gives a good basis for future remote working, this could be more emphasised.” This was further confirmed by INT3: “It’s important to engage the people to see each other in terms of meeting the people in person.” As a possible solution, INT2 mentioned: “The idea is to work together across borders then this means you need to know each other across borders. We are trying to connect our German and Turkish team by bringing them over to meet each other.” To further accelerate cross country communication INT2 added: “The next idea would be to have some work teams from several countries. People coming together and working on an uncommon item. This would be my next idea to accelerate communication across the borders.” The findings seem to be in line with Hoch & Kozlowski

(2014) who suggest that communication in virtual teams is less affected by the lack of face-to-face contact if the team has previously met in person.

3.4.3. Leadership abilities

The author asked what abilities are required from a leader to lead a team and to foster involvement in a distributed environment. Empathy and listening skills were considered important part of distributed leadership. INT3: "Empathy is very important to have from a team leader. To always create the understanding and the work environment where people feel trusted. I think this is the key to build trust." INT1: "Listening is very important to establish trust." Additionally, trust towards your team members has been mentioned as an important ability. INT5: "The trust between people is more complicated. Do they really talk about everything with you because they do not know you very well because you are not there." Further explained by INT4: "I need to trust them that they are doing their work in the end because it is harder to follow up and control." The interviewees seemed to agree with Macaulay (2020) that in order to foster psychological safety, the team members need to trust one another, and that trust and leadership are intertwined. The interviewees seemed to also agree with Hambley (2007) and Liao (2017) that there is a higher risk of miscommunication and greater obstacles to building trust when purely relying on electronic communication. Most interviewees mentioned the willingness to listen as an important ability for leaders in addition to good communication skills. INT1: "We have all kind of regular work, but we must share it with the teams. If we really want to create good teams over ten countries, then I must listen to the feedback from all the countries." This was further supported by INT6: "To be really interested in and focus on people's problems, their daily problems and not just listen, try to help."

Table 14. Mean scores for leadership

No	Question	Mean score	σ
42	My manager fosters involvement and cooperation among team members.	4,0	0,87
46	I have a regular 1 to 1 meeting with my manager.	3,84	1,2

Source: Compiled by the author

As shown in Table 14, the findings obtained from the survey suggest that the managers do foster involvement and cooperation among the teams and some of them set up regular 1 to 1 meetings to improve communication. The mean score for question 42 was at a good level with a mean score of 4,0 however for the question 46 the result was just satisfactory with a mean score of 3,84

suggesting that not all managers organise regular 1 to 1 meetings with their team members (Table 14). The frequency of negative answers for question 42 was at 6% (N= 7) and for question 46 at 15% (N= 17) according to Appendix 6.

All interviewees agreed that it is more difficult to get a feeling for the employees and to read their body language while using virtual communication tools. It has become important to be able to interpret the unspoken and to be able to read the employee using just a video call. As mentioned by INT2 there are two important skills, listening and reading body language without seeing the completed body. INT2: "Now, I worked remotely more than one year and a half now and I learned it better to read the face and to see small movements, which was not necessary before. So, reading the body language without seeing the body." This was further supported by INT5: "Finding creative solutions for the future is much harder to do in a remote setup than in one room. Because when you discuss or propose something and you look in the face, normally you already have some feedback without any speech. And this you miss normally in a remote setup." According to INT5, an important ability is to bring people together and to build a community using online communication tools in addition to being able to communicate openly and if needed directly. This was also stressed by INT2: "You have to bring up the skills to build a community through the camera, just through the camera." The findings seem to be in line with previous research done by Purvanova & Bono (2009) who mentioned that leaders for distributed teams need to devote significantly more time and energy to the interpersonal aspects of leadership than the operational ones.

3.4.4. Information sharing

All but INT6 mentioned that they support collaboration with information sharing and organising regular virtual meetings between their distributed team members. INT2: "The second level of cooperation is with my team leads, we are also distributed, and we use this meeting to exchange a lot of information which is then distributed in the countries." INT3: "I try to connect the problems between the countries and connect the countries together. I try to exchange information." INT1: "I'm trying to establish some kind of presentation from one country to all others. They could present a good project, technical examples what they have done or some other interesting reference cases." Both INT3 and INT4 mentioned the importance of sharing information between teams but also the importance of encouraging these teams to have bilateral discussions. INT4: "They have to have interactions between themselves and to be less dependent on me."

In addition to bringing people together, virtual coffee breaks were mentioned by the functional managers as a good venue to exchange information. INT2 mentioned that they are using virtual coffee breaks to foster social relations between their team members. INT2: “We have also these coffee breaks in several combinations between people.” As further mentioned by the INT2, these types of virtual coffee breaks give the chance to get a closer contact with the remote working people. However, also mentioned by INT2, not everyone has been pleased about these informal meetings. INT2: “People complain about these informal virtual meetings, but they don’t notice how often we meet in normal office surroundings and how much communication we used to have for example at the coffee machine or during lunch.” This result can be interpreted to mean that when working in physical environment, one has more contact with their team members, whereas when working remotely, this contact is reduced to a minimum, and as a result, the leadership has to create a substitute to promote communication and information sharing.

INT1, INT2 and INT4, for instance, use a SharePoint site to pass on any updates to documentation or changes in the organisation they are leading. INT2: “We built a panel and a landing page in SharePoint and several teams in MS Teams”. INT1: “I collect information in one location, and I share it to the whole team.” There was one member who, in addition to sharing information via a SharePoint site, warned that if the site does not have a dedicated support team administering it then there is a risk that the site will not be updated. As learned from INT1: “I don’t like to use SharePoint for knowledge sharing. It is a good way to share information, but I always want to use the easiest way that you don’t copy from one place to another because then the whole day will be spent on updating SharePoint. The importance of having one dedicated team member responsible for keeping the site updated is very important.” The findings suggest that when leading a team within a distributed environment, one not only needs to create a suitable platform for information sharing, in this case regular virtual meetings, one also needs to facilitate the relatively extensive documentation sharing need between the EOU members. The best practise in the EOU it seems, is to use the SharePoint environment to collect relevant information and to create awareness of its presence.

For ICT tools, the author learned that MS Teams is the sole communication environment between the distributed teams. In order to request for support or to share best practices the functional managers have created MS Teams group communications between respective teams within the EOU. Additionally, the functional managers organise regular virtual meetings between their distributed team members and share any relevant information or best practice. The findings seem to be in line with previous research by Roman *et al.* (2018).

3.4.5. Competence support

Majority of the interviewees invest time in 1 to 1 meetings to support their team leaders when it comes to clarifying their roles within the organisation and to bring them up to speed with the relevant information. As mentioned by INT1: “Teams are very different and so are the team leaders. I have several very new team leaders. Only few are very experienced. My experience, first line manager is the most important level in the organisation. If the first line manager level is working efficiently then life for everyone else will be very easy.” On that matter INT6 stated that: “You need to support people with the right environment, right tools and even knowledge.”

Table 15. Mean scores for competence support

No	Question	Mean score	σ
1	I received information to understand the team’s purpose when I was notified about being a member of this team.	4,14	0,83
2	My role in the team was clearly explained to me during joining this team.	4,15	0,78
3	I know what my responsibilities are.	4,33	0,69
4	I know what results are expected from me.	4,17	0,77

Source: Compiled by the author

As shown in Table 15, the questionnaire data supported the authors interpretation with regards to their team members understanding their roles, purpose, responsibilities and expected results as for the questions 1, 2, 3 and 4 which all recorded a mean score of good according to Table 15. The frequency of negative answers was between 1-4%, more specifically for question 1 to 4 the frequency of negative answers was 2% (N= 3), 3% (N= 3), 1% (N= 1) and 4% (N= 4) respectively as presented in Appendix 6. It is understood that the functional managers and their team leads invest time for 1 to 1 meeting not only with their new recruits but with some of their current team members which might contribute positively for the knowledge of ones role. In addition to 1 to 1 meeting, the functional managers often assign a mentor to support the employee. Hence the author considers 1 to 1 meetings and mentorships as a distributed leadership best practise for competence support.

3.4.6. Coordination

INT 2 mentioned that with the dissolvement of country-based organisations and after introduction of the distributed working model, their EOU hub has become more powerful within the Hitachi Energy organisation. When one needs support for example in changing product specifications or

with process changes, having more people involved in the EOU level provides a larger population pool who may support ones request for changes. INT2: “On the management level we can put all our power together. Now, if you are just working in a country, you feel quite small with a team of 10 or 20 people. But remotely, you feel more powerful. Because you see a lot of people across the countries.” This perceived added benefit also requires good collaboration abilities in order to coordinate these teams across countries. The importance of coordination has been emphasised by several interviewees. INT3: “It is important to be able to guide them properly.” INT4 and INT5 brought out the importance of delegating and organising skills. INT6: “When people are working like isolated islands, then there is a need to find clever ways to lead people not to just to give them tasks to do.”

Table 16. Mean scores for coordination

No	Question	Mean score	σ
44	My manager delegates tasks to me.	4,0	0,86
45	My manager delegates tasks to my team.	3,87	0,9

Source: Compiled by the author

The findings presented in Table 16 are in line with the interview findings as for question 44 resulted with a mean score of 4,0 which is on a good level and the frequency of negative answers was 7% (N= 8) while the result for question 45 resulted with a mean score of 3,87 which is on a satisfactory level and the frequency of negative answers was 8% (N= 9) as per Appendix 6. The answers for question 45 would imply a need to further coordinate and delegate activities to the whole team. In this regard, INT5 mentioned: “You also need to have an overview on what’s going on and where? If more support is needed, then you direct your focus towards it.” Additionally, INT2 mentioned that to coordinate within the country one should request the help of the local coordinator. INT2: “There is a local representative, so-called hosting manager. He is the one saying hello to people and guiding them.” This was also mentioned by INT4: “I need to partner up with one of the local team leaders to coordinate activities locally.” The interviewees seemed to agree that a best practice is to use local coordinators and to focus on empowerment of the local teams to use self-coordination which is in line with Kirkman *et al.* 2004.

Based on the findings presented before, the author has identified the best practices of distributed leadership at the EOU:

- SharePoint sites to share documentation related to the respective functional area;

- weekly and monthly virtual information sharing meetings;
- virtual coffee breaks to foster social relations between team members;
- connecting teams between countries to solve technical problems;
- teams presenting projects and best practices across the EOU;
- MS Teams channels for group chats and discussions;
- regular 1 to 1 meeting between the manager and the employee;
- travelling to meet people to foster collaboration and communication;
- providing feedback to the team and the individual.

3.5. Suggestions for improvement

In the final section the author presents an overview of the main collaboration and communication challenges and respective improvement proposals that might support to overcome the challenges within the distributed teams of the EOU (Table 17).

Table 17. Challenges and recommendations

Challenges	Recommendations
1. In-person communication	• Leaders to meet distributed team members once a quarter. • Distributed teams should meet at least once year in person.
2. Geographical distance	• Local team leaders or hosting managers to communicate country specific information regularly to the functional managers.
3. Cultural awareness	• Organise cultural awareness trainings. • Tailor ones communication according to the receiver. • Embrace cultural differences as a possibility to enrich the organisation.
4. Load and capacity planning	• Visualise each team and each employee capacity using any relevant technological solution. • Cross utilise teams to balance out assignments during low or high workload periods. • Set clear goals and follow ups to measure plan versus actuals.
5. Wellbeing and inclusion	• Frequent 1 to 1 meeting, focus on employee wellbeing. • Leaders to foster psychological safety and to create an environment of inclusion in the team. • Leaders to listen intently and focus on the employee. • Frequent virtual informal meetings to foster team spirit.
6. Strategy and vision	• Involve teams and individuals in strategy and vision planning. • Organise regular follow up and information sharing meetings.

7. Onboarding	• On the job training with a dedicated mentor. • Use local and remote mentors. • Regular 1 to 1 meeting with the line manager. • Subject matter trainings for increased technical skills. • Trainings for digital teamworking skills.
8. Knowledge sharing	• Cross country teams to share best practices and projects. • Regular technical presentations and trainings conducted by subject matter experts. • Coaching for existing employees by the EOU members. • Clear and available instructions and documentation.
9. Reward and incentives	• Create a common reward system across the EOU. • Provide incentives for extra effort. • Celebrate project milestones and successes. • Celebrate employee personal events like weddings, birthdays, birth of a child and so forth by sending congratulatory messages and gifts.

Source: Compiled by the author

To conclude, the proposed recommendations aim to support the company and its leaders to overcome the collaboration and communication challenges within the distributed teams of the EOU. The recommendations presented in Table 17 need leadership support and attention to be fully implemented together with constant monitoring in order to truly succeed in creating a supportive distributed working environment across this international engineering team.

CONCLUSION

Distributed working at HE GA Systems EOU has been practiced since the start of the Covid-19 pandemic and it became a permanent working method since late 2021 with the dissolvement of country-based organisations into distributed teams. The distributed teams are dependent on the information provided by the company and on their functional leadership who are responsible for providing the direction to the groups. However, since the introduction of the distributed working model, many experienced engineers have left the company mentioning unclear direction and struggles with distributed working and remote leadership. This has resulted in the company losing out on critical knowledge and skills causing loss of money that have been invested into training their people in addition to effects on knowledge sharing, onboarding and to other indirect consequences. Therefore, the aim of this research was to provide recommendations to the EOU on how to lead their distributed teams across Europe by identifying the challenges with collaboration and communication in distributed teams and by proposing solutions for these challenges. Based on the research problem and aim, the author developed the following research questions:

1. What are the main collaboration and communication challenges in distributed teams at HE GA Systems EOU?
2. What are the best practices of distributed leadership at the EOU?
3. How to overcome these challenges in distributed teams at HE GA Systems EOU?

The author started his research journey by reviewing the theoretical materials by studying the differences between conventional teams and distributed teams, the challenges in distributed working and distributed leadership. A sequential mixed method research was selected for the purpose of conducting the study as the author believes it provides a more intimate view of the current situation within the EOU. For this purpose, an online questionnaire was developed with 55 questions, 38 were based on previous research by Lurey & Raisinghani (2001) and 17 were developed by the author. The questionnaire was sent out on the 27th of February and open until 17th of March. 110 EOU employees participated from 15 countries while the total sample group was 244 employees in 16 countries, the participation rate was 45%. For the data analysis the author used mean scores, standard deviation and frequency tables based on low scoring. For the

qualitative part of the research, the author interviewed the six functional managers who steer the direction of the EOU. They got their chance to provide their view of the current situation within the organisation but also on what they envisioned for the future. The six functional managers were interviewed over MS Teams on the 20th and 27th of March. For the semi structured interviews an interview guide was used with 12 questions developed by the author based on the results of the quantitative survey. The interviews lasted an average of 30 minutes. The author transcribed the interviews and further analysed the interview replies using a qualitative content analysis method. For both quantitative and qualitative studies, the results were presented as the following: the theory was combined with the findings from the interviews complimented with the survey results and authors interpretation.

The author identified nine collaboration and communication challenges with distributed working within the EOU based on the interview findings. Eight challenges can be compared against the results from the qualitative survey with one exception, the lack of load and capacity planning was discovered during the interviews, not during the questionnaire. Out of nine challenges, eight were identified during the literature review however the lack of load and capacity planning is a new problem previously not identified by the author during the literature review. What the author has learned is that geographical distance and the lack of in person communication affects the understanding of these markets and team relations. Combined with a possible lack of cultural awareness and the difficulties with sensing employee wellbeing and inclusions from a distance may further create difficulties with collaboration and communication. To further complicate distributed working, the EOU has a limited load and capacity planning. Additionally, management communication with regards to strategy and vision at this stage is limited. Remote onboarding and knowledge sharing is scarce and requires further support. The author has also learned that employee enthusiasm may be affected by the lack of common reward and incentive systems within the EOU. The author further studied the distributed leadership best practices within the EOU and discovered that information exchange through sharing documentation and regular virtual meetings is considered a crucial step within distributed leadership. Some functional managers also focused on travelling to locations of their remote teams in order to bring people together and to foster social relations.

Based on the nine collaboration and communication challenges outlined above, the author proposed suggestions for improvements for the company. For geographical distance the author suggests the responsible team leader or the hosting manager to communicate any country specific

changes to the relevant teams and functional managers. For lack of in person communication it is beneficial to travel to meet the distributed team members, this is applicable for the leaders and for any new employee. To improve the cultural understanding, employees and leaders should go through a cultural awareness training. Leaders may benefit from tailoring their communication style based on the receiver's cultural background. The author also learned that there is an opportunity in visualising employee load and capacity using any relevant technological solution. This may enable cross utilisation where distributed teams support one another during high load or low load situations. The author has also learned that 1 to 1 meeting between the employee and their manager is important when it comes to employee wellbeing. Leaders should also focus on involving their distributed team members into team events to foster involvement and to create team spirit. As strategy and vision communication have been identified as a problem area within the EOU, leaders should focus on involving their team members early on in planning activities. The author would recommend regular follow up meetings to discuss what has been done, what is ongoing and what needs to be further focused on with regards to vision and strategy. For a positive onboarding and knowledge sharing experience, the author would suggest using the power of the EOU by utilising the vast pool of experienced engineers in order to assign a local or a remote mentor for both new and existing employees. In addition, the author believes that using cross country teams to present best practices and projects to other members would benefit the overall EOU knowledge sharing experience. Finally, a common reward and incentive system across the unit would motivate the employees in providing further effort to go for the extra mile.
The nine main points presented in this thesis emphasise the importance of company focus on their distributed employees to prevent loss of competence and knowledge. The author has presented the research results to the company and a number of improvement projects have been initiate based on the inputs provided within this thesis in order to support the EOU distributed employees.

The author considers the research questions answered and the aim of this thesis fulfilled. The proposed solutions to the challenges may be used by the company to support their distributed work force within the EOU. The research is the first known study of this type within Hitachi Energy and in order to develop the topic further the author proposes to focus on each of the previously mentioned collaboration and communication challenges in order to provide a detailed action plan to support the distributed working environment. Another aspect that is worthy of further research is the distributed leadership requirements for this type of working environments. The author proposes to conduct a follow up study that researches which personal qualities are needed from

distributed managers in order to support their distributed teams sufficiently. And for the company to hire or train the right leaders.

The limitations of the conducted mixed method research are the following, the semi-structured interview method may influence the quality of the collected data as all the interviewees had a different cultural background and none were native English speakers. This might have influence on the authors interpretation of the collected data. As the survey questionnaire and interview guide were developed for this company, they need to be reviewed and adjusted for the purpose of conducting research in another company. The compiled suggestions on how to support the distributed employees and leaders may not be applicable for other companies as the mixed method study was based on the HE GA Systems EOU personnel.

The author is not aware of any similar studies which were conducted in Hitachi Energy however he does emphasise that similar studies should be conducted continuously to monitor the effectiveness of the distributed working method and leadership. The questionnaire of the quantitative research and the interview guide of the qualitative research were tested in HE GA Systems EOU and the findings indicate that both could be applied to other surveys in a comparable nature with adjustments to the survey and interview questions within the company.

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APPENDICES

Appendix 1. Online survey introduction and questionnaire (quantitative research)

Link to the Online survey introduction and questionnaire:

Link to Online survey introduction and questionnaire

Appendix 2. Origin of the online survey questions (quantitative research)

Link to Origin of the online survey questions:

Link to Origin of the online survey questions

Appendix 3. Table of interview participants (qualitative research)

No	Functional role	Country	Interview method	Date	Duration
INT 1	SCADA Engineering Function Manager	Finland	Microsoft Teams	20.03.2023	00:42:19
INT 2	Lead Engineering Function Manager	Germany	Microsoft Teams	20.03.2023	00:35:09
INT 3	Control and Protection Function Manager	Switzerland	Microsoft Teams	20.03.2023	00:22:19
INT 4	Network and Security Function Manager	Switzerland	Microsoft Teams	27.03.2023	00:30:12
INT 5	System Testing Function Manager	Switzerland	Microsoft Teams	27.03.2023	00:30:29
INT 6	OPC Manager	Czech Republic	Microsoft Teams	27.03.2023	00:20:52

Appendix 4. Table of interview structure and questions (qualitative research)

	Introduction
	Name
	Job title
	Country
	Permission to record the interview for the purpose of creating a transcript. Recording will be deleted afterwards.
	Permission to use the name and title in the research.
I	**Team member location in EOU**
1	In which countries are your team members located?
II	**Distributed work challenges at HE GA Systems EOU**
2	In a distributed work setting, what are the main challenges do you face as an employee? Why is it a problem?
3	What could the company do better to support their distributed workforce?
III	**Distributed leadership requirements**
4	In a distributed environment, what are the biggest challenges do you face as a leader? Why?
5	Have you taken any steps to address these issues? Please explain them.
6	In your view, what abilities are required from a leader to lead a team in a distributed environment? Why?
7	How do you support collaboration in your team in a distributed environment?
8	How do you support communication in your team in a distributed environment?
9	What are the typical communication channels in order to transfer the EOU strategy?
10	How do you onboard new hires?
11	How do you support knowledge sharing?
12	Does your team have a set reward system for performing their work successfully? What are you doing?

Appendix 5. Coding frame and transcribed interviews (qualitative research)

Link to the Coding frame and transcribed interviews:

Coding frame and transcribed interviews

Appendix 6. Descriptive statistics (quantitative research)

No	Category	Question	Mean	σ	Freq. of neg. resp.	Cumulative percent
1	Communication	I received information to understand the team's purpose when I was notified about being a member of this team.	4,14	0,83	3	3%
2	Communication	My role in the team was clearly explained to me during joining this team.	4,15	0,78	3	3%
3	Communication	I know what my responsibilities are.	4,33	0,69	1	1%
4	Communication	I know what results are expected from me.	4,17	0,77	4	4%
5	Communication	New team members are quickly brought up to speed when they join the team.	3,51	0,89	11	10%
6	Communication	The team is equipped with the necessary skills and competence to work as a team.	3,93	0,81	5	5%
7	Communication	Team members are in contact with one another on a regular basis in order to conduct routine business.	3,95	0,85	7	6%
8	Communication	Team members are in contact with one another on a regular basis for social, or non-business, purposes (during work hours, example virtual coffee break).	3,31	1,07	29	26%
9	Communication	The electronic methods we use to communicate with one another are sufficient.	4,09	0,80	5	5%
10	Communication	My team is aware of the risks of online communication (understanding cultural differences, potential for misinterpretation etc).	3,90	0,73	3	3%
11	Collaboration	Knowledge and information sharing is understood to be a group norm within my team.	4,02	0,80	6	5%

12	Collaboration	I have received sufficient training from the organisation to develop my core technical and teamwork skills.	3,35	0,99	21	19%
13	Collaboration	Team members have received training focused on becoming more effective regarding teamwork in the virtual team setting.	3,06	0,96	32	29%
14	Collaboration	I feel that my skills and competences are sufficient to perform my work.	4,11	0,73	2	2%
15	Communication	The team has regular virtual meetings dedicated to foster social relations.	3,40	1,06	23	21%
16	Collaboration	During the team's first meeting, time was dedicated to team building exercises (examples: meeting individual team members; team purpose and goals; discussing conflict resolution).	3,15	1,09	32	29%
17	Collaboration	I had the opportunity to meet all my team members in person when I started.	3,75	1,28	22	20%
18	Collaboration	Working hours and off-work hours are clearly defined and respected in my team.	3,82	1,03	13	12%
19	Collaboration	I rely upon other team members to complete my assigned work.	3,49	0,97	19	17%
20	Collaboration	Team members trust one another and will consult each other if they need support.	4,31	0,74	3	3%
21	Collaboration	When disagreements occur, they are usually addressed promptly in order to solve them.	3,75	0,87	7	6%
22	Collaboration	Team members have a shared understanding of what the team is supposed to do.	3,93	0,73	6	5%
23	Collaboration	Team members are clear on how to best perform our work tasks.	3,85	0,70	4	4%
24	Collaboration	Individuals are encouraged to take initiative and participate in important decisions.	3,75	0,93	9	8%
25	Collaboration	Team member morale is high in the team.	3,71	0,91	9	8%

26	Collaboration	There is respect for each individual in the team.	4,40	0,75	2	2%
27	Collaboration	I feel my input is valued by the members of the team.	4,07	0,82	4	4%
28	Collaboration	The team’s leaders offer new ideas or approaches to do our jobs better.	3,76	0,94	8	7%
29	Leadership	The team’s leaders are friendly and can be easily approached.	4,35	0,89	5	5%
30	Leadership	Team members feel that the team’s leaders are helpful and supportive.	4,15	0,89	5	5%
31	Leadership	The team’s leaders make sure team members have clear goals to achieve.	3,84	0,92	9	8%
32	Leadership	The team’s leaders keep individuals working together as a team.	3,85	0,85	5	5%
33	Leadership	The organisation's leaders have created a vision and strategy for the Engineering Operating Unit.	3,36	0,99	20	18%
34	Leadership	This vision is articulated to all members in the Operating Unit.	3,25	0,96	22	20%
35	Leadership	The management approach in our organisation promotes initiative in team members.	3,35	1,03	19	17%
36	Leadership	My team leader values my input.	4,09	0,94	7	6%
37	Leadership	My manager is well informed about my progress prior to my yearly performance review.	3,74	0,95	8	7%
38	Leadership	My manager is well informed about my accomplishments prior to my yearly performance review.	3,77	0,94	7	6%
39	Leadership	My manager provides regular feedback to me.	3,75	0,97	12	11%

40	Leadership	My manager provides regular feedback to my team.	3,66	0,95	14	13%
41	Leadership	My manager is always available when one needs help.	4,36	0,78	4	4%
42	Leadership	My manager fosters involvement and cooperation among team members.	4,00	0,87	7	6%
43	Leadership	My manager supports and encourages my development (training, education, job change).	3,91	0,99	8	7%
44	Leadership	My manager delegates tasks to me.	4,00	0,86	8	7%
45	Leadership	My manager delegates tasks to my team.	3,87	0,90	9	8%
46	Leadership	I have a regular 1 to 1 meeting with my manager.	3,84	1,20	17	15%
47	Leadership	My manager has the understanding of the local market where me and my team operates in.	3,94	0,98	9	8%
48	Leadership	My manager knows my strengths and weaknesses in order to assign me manageable projects.	3,98	0,98	9	8%
49	Leadership	My manager knows the local processes and is connected to the relevant stakeholders in order to support my work.	3,87	0,95	8	7%
50	Leadership	The team celebrates its successes.	3,05	1,13	37	34%
51	Leadership	I am rewarded individually for my work efforts.	2,84	1,19	42	38%
52	Leadership	All team members are rewarded when the team reaches its goals.	2,82	1,04	36	33%
53	Leadership	My manager makes it clear what rewards one can expect to receive when performance goals are achieved.	2,85	1,17	39	35%

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