THE IMPACT OF TEAM SIZE ON COMMUNICATION IN GLOBALLY DISTRIBUTED TEAMS

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Master's Thesis
Intercultural management and communication
Department of Language and Communication Studies
University of Jyväskylä
Autumn 2020

UNIVERSITY OF JYVÄSKYLÄ

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Title The impact of team size on communication in globally distributed teams	
Subject Intercultural Management and Communication	Level Master's thesis
Month and year 12/2020	Number of pages 85+1

Abstract

Effective communication in global virtual teams is vital for team performance. It is well-established that several communication distance factors influence the communication of a globally distributed team. However, the size of the team in virtual teams has not been adequately analysed. Therefore, the purpose of the paper is to determine how the team size influences communication distance factors in globally distributed teams and how group size is reflected in teams' communication practices. In this context, a virtual team is defined as a globally distributed team, which works in different time-zones and communicate primarily via communication-technology.

In order to test the thesis statement, this study was conducted qualitatively. Eleven members of two virtual teams from three different countries were interviewed, and their meetings were observed using reflective journaling. In analysing the data, the six-steps framework of thematic analysis was used in order to generate codes and themes to find key features of the data set. The findings of the study give an overview of team communication in virtual teams and how team size influenced communication aspects within distance factors that affect communication practices. Moreover, traditional and critical scholars' perspectives were analysed and compared in order to give suggestions for further improvement of communication in globally distributed teams. This thesis aimed to use the results of the study to improve internal communication in the organisation even further.

This thesis indicates that the size of a virtual team does matter when the team aims to maintain effective communication practices. It was possible to find that larger virtual teams might experience more communication difficulties that are caused by distance factors.

Despite the size of the sampling, the findings can be beneficial for the case company and other organisations in understanding how the team size might affect communication practices in globally distributed teams. Some challenges concerning the study were limited timespan and resources. Research results can be utilised in both public and private companies, which aim to improve their internal communication even further. These results suggest that regardless of the complexity of the project, more effective communication in virtual teams is possible to reach with a well-organised small team. Thus, when planning to implement distributed teams, management needs to take the team size into consideration.

Keywords

Virtual team, globally distributed teams, internal communication, communication distance factors

Depository University of Jyväskylä

Additional information

UNIVERSITY OF JYVÄSKYLÄ

Tiedekunta Humanistis-yhteiskuntatieteellinen tiede-kunta	Laitos Kieli- ja viestintätieteiden laitos
Tekijä Olga Vallin	
Otsikko The impact of team size on communication in globally distributed teams	
Oppiaine Intercultural Management and Communication	Työn laji Pro Gradu-tutkielma
Aika 12/2020	Sivumäärä 85 +1

Tiivistelmä

Kansainvälisten virtuaalitiimien tehokkaalla sisäisellä viestinnällä on erityinen rooli yrityksen menestyksen kannalta. Useat tutkimukset ovat osoittaneet, että tiimin hajauttamisesta johtuvat vuorovaikutushaasteet (communication distance factors), joita virtuaalitiimit kohtaavat päivittäin, vaikuttavat negatiivisesti tiimin keskinäiseen vuorovaikutukseen. Hajautettujen tiimien ulottuvuuksia ovat maantieteellinen, ajallinen ja kulttuurinen hajautuneisuus sekä viestintäteknologia, joka on hajautettujen tiimien vuorovaikutuksen muoto. Tehokas sisäinen viestintä on oleellinen osa yrityksen toimintaa. Näin ollen viestinnän sekä vuorovaikutuksen kehittämisen tärkeys korostuu erityisesti työntekijöiden keskinäisessä viestinnässä.

Tutkimukseni tavoitteena oli tarkastella, miten tiimin koko vaikuttaa hajauttamisesta johtuviin vuorovaikutushaasteisiin sekä millainen vaikutus tällä on tiimin viestintäkäytäntöihin.

Tutkimus toteutettiin laadullisin menetelmin ja aineistonkeruumenetelmänä toimi teemahaastattelu. Tavoitteena oli selvittää vähentääkö pienempi tiimin koko hajauttamisesta johtuvia vuorovaikutushaasteiden vaikutuksia. Kokonaisvaltaisen tutkimuksen saavuttamiseksi tutkielmassa käytettiin monimenetelmällistä tutkimusmenetelmää. Tutkimuskohteena oli kansainvälisen yrityksen ohjelmistokehityksen ja sovelluskehityksen kansainvälinen tytäryhtiö, ja haastatteluun osallistui 11 työntekijää kahdesta eri tiimistä. Haastattelun lisäksi tulosten vahvistamiseen käytettiin tiimien sisäisen vuorovaikutuksen tutkimista heidän omassa ympäristössään. Aineisto analysoitiin käyttäen teemoittelua, jolla pyritään löytämään tutkimusaineistosta toistuvia teemoja ja aiheita. Näiden avulla voidaan pyrkiä vastaamaan tutkimuskysymyksiin. Tutkimusilmiötä tarkasteltiin kokonaisuutena ja tutkimustulosten analysoinnissa hyödynnettiin lähdekirjallisuutta. Näin tutkimuksen tuloksia pystyttiin vertaamaan ja analysoimaan kriittisestä näkökulmasta. Tämän lisäksi tutkimus pyrki kritisoimaan edellisten tutkimusten näkökulmia tiimin hajauttamisesta johtuvien vuorovaikutushaasteiden todellisista vaikutuksista. Näiden perusteella tutkimus pyrkii kehittämään kansainvälisten yritysten viestintää entisestään.

Tulokset antoivat viitteitä siitä, että pienemmällä tiimin koolla on vaikutuksia tiimin jäsenten väliseen vuorovaikutukseen. Pienemmän tiimin koon voidaan väittää vähentävän hajauttamisesta johtuvia viestintähaasteita ja edesauttavan tiimin viestintäkäytäntöjä päivittäisviestinnässä.

Tutkimustuloksia voidaan hyödyntää sekä julkisissa että yksityisissä yrityksissä, jotka pyrkivät parantamaan omaa sisäistä viestintää. Tutkimuksen tulokset osoittavat, että projektin monimutkaisuudesta riippumatta tiimin tehokkaampi viestintä on mahdollista saavuttaa hajautetuissa virtuaalitiimeissä tiimin koon ollessa pieni.

Asiasanat

Virtuaalitiimi, Kansainvälisesti hajautettu tiimi, sisäinen viestintä, viestinnän haasteet

Säilytyspaikka Jyväskylän Yliopisto

Muita tietoja

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1 INTRODUCTION

Effective communication is the foundation of every successful company. Organisations must improve internal communication to succeed under economic pressure and the need for effective communication increases when the communication occurs primarily via communication technology. Successful business and competition require excellent internal communication in which a manager takes into account cultural interaction, business characteristics and the business action of other countries (Kukovec et al., 2018, 50). Effective communication is rather wide concept, but in this thesis it refers to the definition of Marlow et al. (2017); person sends a message, the receiver gets the message and acknowledges it, and lastly, the sender receives a message or acknowledgement that the message has been received. These elements need to be fulfilled in order to avoid misunderstandings and accomplish common goals (Marlow et al., 2017, 577).

Virtual teams have become central tools for companies in a globalised market. A virtual team is a group of team members who work for the same project but are geographically distributed in several locations. They use communication and information technologies to work on a project (Van der Kleij, 2007; Marlow et al., 2017). In this thesis virtual team is also defined as a globally distributed team or global virtual team, because researched teams are located in several countries.

The purpose of this thesis is to analyse the success of internal communication within a multinational company, and the main focus of the study is based on the idea that a reduction in the size of teams might decrease communication challenges in global virtual teams. Reduced team size requires proactive participation, which is crucial for team communication success. In fact, participative communication has been identified as strongest indicator of effective communication and enables a better understanding of the objectives (Daim et al., 2002, 207). The need to acknowledge the impact of team size has been recognised by other researchers as well; for example, Hinds et al. (2003) indicate that research would be more relevant if it recognised team size, even though it is reasonable to expect that increase in team size possibly has a negative impact (629). In the same vein, Alaiad et al. (2019) note that several studies do not mention the size of the team and its possible impacts on the communication between team members and the reliability of the studies' results (230). Hoegel (2005)

in his paper shows that team size has been identified being important factor on communication process in on-site teams. Still, much of the research up to now has focused very little on the connections between the size of teams and communication challenges. Therefore, it is vital to define the impact of team size on communication in global virtual teams. The lack of observation of the size factor can be seen as a significant drawback.

One of the motivations to use real-life data is that traditional distance factors have been studied and analysed in various studies, but so far, there is not much large-scale research or field study examining how team size might have an impact on internal communication in global virtual teams. The underlying idea is that real-life data could help to redefine the actual impact of traditional challenges that global virtual teams experience. Studies on communication challenges in virtual teams have yielded inconsistent results, and research findings have been criticised for their lack of external validity and lack of real-world settings, which would ensure broader generalisability (Alaiad et al., 2019, 230).

This thesis will provide an overview of three traditional distance dimensions in globally distributed teams, which are temporal, geographical and cultural differences, and how these factors affect teams' internal communication. In addition, the thesis includes communication technology as a distance factor.

The study takes into consideration various studies, but it takes a critical view of previous research and suggests the possibility that these traditional distance factors may not have as significant an impact as previously thought. As a result, communication in virtual teams must be further evaluated and analysed. Indeed, it is possible to claim that team size influences the efficiency of communication, especially in the view of employees, and it can reduce the negative impact of other distance factors. The issue of team size is essential for three reasons. First, too large time size has been recognised to diminish the quality of communication in co-located teams (Hoegl, 2005). Second, examining team size enables the researcher to identify communication issues that are caused by the size, and third, and most importantly, it is possible to argue that team size is a significant factor when identifying the possible impact of communication distance factors.

In order to analyse the impact of team size, semi-structured interviews combined with observation were conducted to provide real-world settings in which research participants could reflect on a real-life situation and the observations could support the answers that interview data delivered. These perceptions were compared and analysed to form a conclusion on the impact of communication distance factors and how these can be prevented.

1.1 Research purpose and questions

The thesis starts with the assumption that the size of the team in virtual teams has not been adequately analysed and that reduced team size can be highly beneficial for team communication. In fact, many studies do not recognise large team size as a distance factor for virtual teams. For this reason, this thesis aims to determine whether the size of the team has an impact on internal communication while taking a critical view of traditional distance factors and questioning whether they play a smaller role in communication success than previously thought.

The literature review begins by delineating previous studies related to communication in virtual teams and distance factors that teams face in communication. These previous studies are introduced as a table derived from the available literature, which is analysed later in the same section

The research methodology focuses on exploring communication challenges that team members experience when they communicate with one another. The aim of the study is to explore employees' experience of communication as a whole and discover if team size have an impact on communication challenges that globally distributed teams experience and consequently also on the quality of communication practices.

The research questions are stated as follows:
- How does the size of a team influence the communication distance factors in globally distributed teams?
- How is group size reflected in teams' communication practices?

To answer these questions, the study relies on ethnographic research methods, which provides a more in-depth insight into employees' and employers' perceptions of internal communication as well as which communication challenges they experience and how these challenges might be reduced. The data consists of (remote) interaction between the participants in the application Slack and interaction between participants in different meetings. The analysis of the online semi-structured interviews examines how the participants view communication and how distance factors influence communication. By combining observation with interviews, it was possible to verify the data through observation. Two researched projects were equivalent due to their similarity in the framework of everyday interaction, and the main difference between the teams was their size. The thesis does not cover communication challenges related to external communication, like the interaction between clients and the company.

The study is a case study, and therefore it has an explorative character. Its primary purpose is to give real-life value to the field of communication and management, which, as mentioned before, is very needed. The study aims to find out how a global virtual team communicates daily in conditions that temporal, cultural and

geographical dispersion create, and to explain how the impact of these distance factors on communication practices might be reduced or even eliminated by reducing the team size.

1.2 Structure of the thesis

The first part of this thesis is dedicated to the virtual team in current literature, explaining how this term is defined, including the difficulties with the term, and what challenges globally dispersed teams have in the face of current economic pressure. This thesis adopts a view of communication as a process, which is applied in order to discuss the second theme of the thesis: communication challenges that virtual teams experience on a daily basis. Traditional distance factors like geographical, temporal and sociocultural distances are presented and defined, with a critical approach to the current view of the impact of these factors. Finally, the literature review discusses communication challenges from the perspective of team size and the Scrum management framework.

In the methodology section, the data collection and data analysis choices are explained and justified. Regarding the data collection process, German company which agreed to participate in this study provided access to observe daily interaction between team members. The data collection includes the observation of two teams and conducted interviews. Data were analysed using a deductive thematic analysis to find common themes within participants' answers. Theory-based analysis was necessary to define how the team size influences the impact of distance factors.

In the findings chapter, the thesis presents themes identified from the observation and interview data comparing perceptions of two different teams. Themes are organised in broader categories in order to identify main points of the research. The discussion analyses how team size influenced communication aspects within distance factors affect communication practices and summarizes the main findings. Additionally, current literature on the impact of distance factors is elaborated and applied in the discussion and conclusion of this study.

2 VIRTUAL TEAMS

The definition of a virtual team varies between different authors. Van der Kleij (2007) and Hertel et al. (2003) claim that there is no clear definition of a virtual team because even co-located team members use communication technology. Van der Kleij (2007) claims that a virtual team can be labelled as a team with high degrees of virtuality. Yet, one definition of the virtual team from literature is unambiguous: A virtual team can be defined as a team with some degree of virtuality. Thus, in this thesis, a virtual team is defined as a group of team members who work for the same project but are in different locations. They use communication and information technologies to work on a project (Van der Kleij, 2007; Marlow et al., 2017). This definition is close to Gibson and Cohen's (2003) definition of a virtual team. In fact, their definition is similar to the definition of 'a traditional team'. This definition was chosen because of the interest of the thesis. The research interest is not limited to a certain degree of virtuality. Instead, the focus is on team processes like communication. In this thesis virtual team is also defined as a globally distributed team or global virtual team, because researched teams are located in several countries.

The use of virtual teams in organisations has increased rapidly. Dulebohn and Hoch (2017) presented a survey which showed that 85% of 1,372 business respondents worked on virtual teams (569). Organisations likely use distributed teams because of the possibility to hire the most qualified employees. No matter the physical distribution, these teams can include the right people (Scott, 2013, 301). Wider employee diversity enables greater creativity and problem-solving possibilities, which can give the advantage for a company to be close to local markets (Scott, 2013, 303).

Despite the increasing number of virtual teams, the face-to-face team is still considered a traditional team. Co-located teams are often identified as highly functioning because they have better interpersonal interaction. Members also share the same working hours and can more easily hold unplanned meetings.

Regardless of the difficulties virtual teams experience daily, interest in global virtual teams is growing. This growth raises the question of what characteristics make business distribution so desirable. The next sub-question presents principal findings of attributes of virtual teams.

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2.1 Attributes of virtual teams

Virtual teams function in the same way as any co-located team. The team has a common goal which contains the interdependent task and purpose. According to Scott

(2013), effective teams share three characteristics. They have clear objectives, knowledgeable team members and defined standards of excellence. A slightly different approach can be found in the research of Van der Kleij (2007), who claims that team members need to be flexible and dynamic to be effective. Both studies indicate that personal traits have an impact on the effectiveness of the team, but Scott (2013) identifies clear objectives as an important characteristic. Both, however, share similar approaches that can be found in organisational communication studies; the virtual team enables better use of different employees.

The approach to virtual teams has been from a management perspective. A similar pattern can be found in how authors have defined the attributes of virtual teams. Approaches to attributes of virtual teams are surprisingly similar to one other. As an example, Van der Kleij (2007) and Scott (2013) define a virtual team as a group of the best people for the task regardless of their location. Such teams can bring dispersed members together, thus reducing travel time and coordination expenses.

Geographically dispersed teams use a 'follow-the-sun' approach in their work, meaning that one part of the team in one time zone hands the work to their teammates as they start their day. They continue working with the information that the first part of the team provided (Morisson-Smith et al., 2020). This approach allows for 24-hour working and higher productivity in the company. Working in a globally distributed team enables effective knowledge sharing and collaboration.

In this kind of definition, employees are seen as a part of an organisation. This view is common to organisation studies and especially earlier organisational communication studies: the employee is part of an organisation to increase productivity; thus, he is part of the operating sequence (Miller, 2008). In current studies the approach has moved from communication as a tool to communication as a process. The same trend can be found in the study of virtual teams. In fact, researchers like Krawczyk-Bryłka (2017) and Marlow et al. (2017) demand a change in focus from employee communication as a tool to communication as a process. The next sub-chapter takes a closer look at the challenges of virtual teams

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2.2 Challenges of virtual teams

Challenges of virtual teems seems to be related to coordination and weak interpersonal communication. As mentioned in the previous sub-chapter, virtual teams enable more rapid economic growth. However, this growth might create problems that are common for larger organisations. Virtual teams may have problems like ambivalent feelings about their role and reduced level of commitment (Van der Kleij, 2007, 17). As a consequence, team members may not have a shared understanding of the common

goal, thus leading to failure of the virtual team (Van der Kleij, 2007, 17). Few organisations proactively create virtual teams that have a competitive advantage and achieve things that were not possible before (Van der Kleij, 2007, 17). Organisations seem to copy the organisation culture and practices, even though virtual teams require its own rules and practices to communicate and work.

Several studies state that one of the main issues of virtual teams is that task completing takes longer compared to co-located teams (Scott, 2013; Van der Kleij, 2007; Marlow et al., 2017). Van der Kleij (2007) underlines that different locations and time zones can complicate frequency of communication. This situation requires flexibility from team members because even a one-hour time difference can diminish interaction. If part of the team is located in different time zone, team members may need to wait until the next day to get an answer. As a result, task completing takes longer unless the teammate is flexible with working hours. Therefore, virtual teams require increased coordination and further recognition of communication. A lack of coordination and communication increases the risk of trust issues, conflicts and out-grouping (Scott 2013). A study by Hinds et al. (2005) supports this claim. It indicates that subgroups can create an us-versus-them mindset. As a result, they can diminish shared understanding and interaction even further (Hinds et al., 2005; Scott, 2013, 303). Sivunen (2007) confirms that distributed teams experience out-grouping. She observed team members' social interaction and communication technology use in global virtual teams and found out-grouping was due, in part, to geographical distance. Team members in other locations were not able to take part in interpersonal conversation in the same way as on-site team members. One reason for that is that there are no social context cues, which is argued to be a result of computer-mediated communication. Members are not aware of facial expressions, posture or tone of voice of other members. Lack of social context cues creates lower levels of interpersonal trust. As a result, a team member might feel more anonymous, and the person often aim to focus on himself rather than on the team perspective (Van der Kleij, 2007, 19). Such lack of social context and interpersonal interaction results in a higher risk of conflicts.

Hinds and Bailey (2003) also suggest in their theory-based explanation that geographical distance might create conflicts. More precisely, weak interpersonal interaction and information sharing create conflicts in teams. Interestingly, Hinds and Mortensen (2005) found that even though there was evidence that distance might create conflicts, there was little empirical evidence indicating whether the risk of conflict was greater than in on-site teams. Yet, their empirical study showed that there is higher risk of conflicts in virtual teams and spontaneous communication is claimed to have a major impact on communication in distributed teams (Hinds & Mortensen, 2005). It should be noted that both Sivunen (2007) and Hinds and Mortensen (2005) do not note factors like the impact of team size or the communication process.

In the end, on-site teams share similar problems with virtual teams. Regardless of the virtuality, the aim is to achieve the goal of the project at hand. In any company

a key team member can scatter during projects when the organisation is continuously growing. Van der Kleij (2007) notes that one of the main problems in the team formation is that often virtual teams are not proactively created. Instead, the organisational culture has been copied from the on-site team. This possibility raises the question of whether time-zone differences and distribution create the problems. Instead, conflicts could occur because of the lack of coordination and communication or because of the impact of the team size.

In summary, previous literature hints that distributed teams experience more conflicts than on-site teams and that these conflicts have an impact on communication effectivity. However, previous studies do not show how team formation, organisation culture, which is based on virtual teams need and team size could impact on communication and working of virtual teams.

The next chapter focuses on defining which characteristics need to be fulfilled to maintain efficient communication and, most importantly, which factors diminish effective interaction in globally distributed teams.

3 INTERNAL COMMUNICATION IN VIRTUAL TEAMS

Communication can be considrered to be fundamental tool for organisation success. Simultaneosly, it is a process of information changing between people and it occurs and exsisr without any specific purpose.
To understand team interaction, it is necessary to define the concept of communication. Communication is one of the main concepts in several different organisation theories, but there are two main theoretical perspectives that form the theoretical field of corporation communication: communication theory and management theory (Cornelissen, 2004, 17).

Both theoretical stances encompass a wide variety of research focused on different areas within the field of communication (Cornelissen, 2004, 17). Communication theory focuses on the process of communication and how the social system influences it and it has two perspective: critical and rhetorical. These perspectives focuses on communication as a phenomenon and process. Scholars demand that the corporation recognise how its communication process influences individuals and society (Cornelissen, 2006, 17).

Management theory focuses on the corporation itself and on the relationship between management and stakeholders (Cornelissen, 2004, 18).

Even though the perspectives are clearly different in how they define communication, these perspectives should be acknowledged as complementary to each other (Cornelissen, 2006, 19). Therefore, communication can be recognised as a tool or a process. Communication as a tool enables the achievement of company objectives, but it is only possible if the communication process is understandable. This thesis aims to contribute in communication theory, by analysing how the communication process is affected by team size and how it diminishes distance factors that global virtual teams experience.

Both perspectives have evolved, but they share one similar approach. In both theories, communication is a process or a tool for management. In fact, much of the

current literature still takes a management-centric approach. Hence, the management-centric approach of previous studies and theories requires further investigation.

Despite the knowledge that the real value of internal communication is to help develop business ends to turn strategy into action, the minority of studies focus on employee-centric approaches (Quirke, 2008, 4; Uusi-Rauva & Nurkka 2010, 303). Truss et al. (2006) found that 42% of employees do not receive enough information about what happens in their organisation (16). A survey by Towers Watsons (2010) supports this finding, indicating that only half of corporations communicate well enough how employees' actions can increase productivity. In the same vein, Gray (2004) found that only 52% of employees were satisfied overall with the communication. Gray's research was based on the organisation in Australia; still, similar results have been reported in other Western countries. Therefore, it is possible to claim that communication between team members and management is weak.

Research by Goldhaber et al. (1978, 82) underlines that employees require fluent communication which primarily focuses on information about personal and job-related matters. There is also a need for information about internal decision making and better opportunity to express their complaints (Goldhaber et al. 1978, 82). It is not surprising that to date, several studies have reported that companies suffer from a lack of internal interaction.

Managers need to create an environment where interaction is person-centred. Indeed, results of several studies indicate that person-centred interaction has a positive impact on the leader–member relationship. Corporations that are highly effective communicators share their rationale behind business decisions and report how employees' input impacts on productivity (Fix & Sias, 2006, 42). Effective communication is even more vital in global virtual teams. As mentioned earlier, in this context a virtual team is defined as a temporary, culturally diverse group which is geographically distributed in different locations and communicates mostly electronically (Snellman, 2014, 1255; Daim et al., 2010; Ågerfalk et al., 2008, 1).

In order to define good communication, it is necessary to identify the parts of the communication process. The definition of effective communication by Marlow et al. (2016) will be used in this thesis due to the significant attention it has received. This definition was also chosen to further explain what the communication process includes. Marlow et al. (2006) identify three aspects of communication: communication frequency, communication quality and communication content (577). Communication content has two forms, which are task-oriented interaction and relational interaction. Task-oriented interaction involves an aim to complete a task, and relational interaction describes communication with an interpersonal nature (Marlow et al., 2017, 579).

Quality of communication alludes to the degree to which the person understands the message. The communication needs to clear, fluent and on time. Quality of communication can be divided into two aspects, which are communication timeliness

and closed-loop communication (Marlow et al., 2017, 578). Communication timeliness plays a vital role in the interaction of globally distributed teams due to the asynchronous nature of communication. Closed-loop communication has three parts: a person sends a message, the receiver gets the message and acknowledges it, and lastly, the sender receives a message or acknowledgement that the message has been received. These elements need to be fulfilled in order to avoid misunderstandings and accomplish common goals (Marlow et al., 2017, 577).

This view is supported by a study from Muszynska (2018) which highlights the necessity of closed-loop communication. The study presents a table of 19 aspects of communication effectiveness with selected literature sources. According to the study, communication needs to be current and on time, the sender needs to provide correct information which is well planned and the purpose of the communication should be addressed. As mentioned in the study of Marlow et al. (2017), closed-loop communication requires that the receiver acknowledge the message. Even though communication is part of teamwork, Muszynska (2018) highlights the impact of individual responsibility. Both communicators need to put personal effort into communication and develop communication skills in order to achieve high-quality communication (Muszynska, 2018, 68). Similarly, other studies (see Powell et al., 2004; Daim et al., 2012; Alaid et al., 2019) indicate that the emphasis for communication should be more on individual responsibility.

While several studies emphasize individual responsibility, organisation is also required to enhance and maintain efficient communication. Team members need to have access to communication records and define which communication channels they prefer to use (Muszynska, 2018, 67). Feedback, which should be directed to the recipient, also plays a crucial role (Muszynska, 2018, 68; Butt et al., 2016; Powell et al., 2004). To maintain high-quality communication, it is vital to find essential communication tools that support the needs of the team. While on-site teams can have face-to-face meetings, virtual teams depend fully on communication tools and information technologies (Van der Kleij 2007, 15). That is the aspect that makes communication in virtual teams unique. Collaborative tools (known as groupware) enable decision making, coordination of activities and information sharing (Van der Kleij 2007, 15). At best, collaborative tools can minimise travel costs, allow a simultaneous or asynchronous interaction between multiple team members and allow text-based communication, which maintains a record of communication (Van der Kleij, 2007, 15). Organisations can use multiple collaborative tools to communicate, but they must find the right collaboration tools to communicate effectively.

In order to have efficient communication and achieve these three aspects, the team needs to have clear characteristics, dynamic functions and high team satisfaction (Marlow et al., 2017). These elements are required from both on-site and virtual teams, but as mentioned, virtual teams depend fully on communication technologies, which oblige the company to pay attention to distance factors that negatively influence

communication. The next sub-chapter elucidates what these communication distance factors are and how they challenge communication in globally distant teams.

3.1 Communication challenges in globally distributed teams

As mentioned before in the thesis, companies might face difficulties to communicate the. As previously mentioned in this thesis, companies may face difficulties in communicating their objectives and goals, which can become even harder in globally distributed teams. This raises the question of why corporations and teams are not always able to communicate their objectives in globally distributed teams, and what is the cause of their inability to do so. In addition, it is vital to ask why internal communication between team members can be challenging. According to several previous studies, globally dispersed teams face three distance factors in their communication, which are geographical, temporal, and sociocultural distance factors (e.g., Ågerfalk et al., 2008; Jimenez, 2017; Scott, 2013; Lilian, 2014; Cummings, 2011; Herbsleb et al., 2003; Ortiz de Guinea et al., 2012). These distance factors have been argued to reduce the effectiveness of working, but they have also been identified as having a negative influence on the quality, content and frequency of communication.

The perception of the impact of location, distance and time factors varies significantly. Marlow et al. (2017) concluded that findings within this area have been inconsistent due to the different research settings. It has been found that laboratory settings generate different results than field settings (577), and there is still considerable ambiguity with regard to the definition of factors. For example, physical distance can be defined in various ways. It can be as small as 30 meters, which already affects communication negatively, or the distance can be considered close if there is the possibility to regularly fly directly to the distributed office (Morrison-Smith et al., 2020, 4). Thus, already different branches of organisations can have different organisational culture, and therefore it is possible to find different outcomes in results. In addition to traditional distance factors, communication technology is also mentioned as a distance factor in this study. This factor is slightly different from traditional distance factors. In other studies it is not often mentioned as a distance factor, but rather as a communication tool. In fact, communication technology is the main factor that differentiates virtual teams from co-located teams. However, this study extends the previous literature on the topic by addressing the fact that communication technology has a major role due to its impact on daily communication.

As mentioned before, communication needs to meet three criteria related to quality, content and frequency in order to be effective. Taken together, previous studies support the notion that geographical, temporal and sociocultural distance diminish the quality of communication. However, it is ambiguous which factors have

been claimed to be the most significantly adverse factors. It is vital to note that the impact of factors can vary between teams. Table 1 gives an overview of which factors are identified to be the most significant distance factors in communication and describes how these factors influence communication.

It is worth noting that researchers have tended to focus on external factors like location and time rather than on internal problems. Such approaches have failed to address issues like the size of the team and an inefficient communication process. The impact of team size on communication is further discussed in sub-chapter 3.2. Moreover, previous studies have some issues with interpretation: the definition and separation of different factors might vary between different studies, and this possibility needs to be taken into account. The lines between different factors have blurred, and, for example, geographical and temporal distance factors often have similarities.

Table 1 lists names and descriptions of four distance factors that have an impact on communication in global virtual teams together with selected literature sources where they are mentioned. These literature sources were selcted for the prupose of the thesis to identify which ascpects within distance factors have an impact on communication in globally dsitributed teams. The list covers 45 sources (15 from each phrase below), including journal papers, conference papers and studies, which were published between 2015 and 2020. The date range was chosen due to the constant development of communication technology, to ensure that the latest technology was taken into account in the studies. The following phrases were used in the Google Scholar database to identify relevant sources:

- Communication challenges in virtual teams (435 results)
- Communication challenges in globally distributed teams (373)
- Communication challenges in global virtual teams (432)

These phrases yielded several results, and due to limited time and thesis topic, only 45 items were analysed. Each item needed to cover a topic related to private organisations. Results were filtered according to relevance to the topic, and searches were conducted with every phrase with the following words: virtual OR team, "communication in virtual teams." Each search needed to include the word communication because the focus of this thesis is fully on communication in virtual teams. Several studies show that the following distance factors have an impact on participation, work and effectiveness as well, but these topics are not covered in this thesis. The Publication Forum ensured the reliability of items. Publication channels that did not meet the criteria at least for level one were not used in the thesis. Some studies had limited acceptability, and consequently, another study was chosen from the reference list of the inaccessible paper. In Table 1, the most frequently mentioned distance factor is placed first, and the least mentioned is last.

TABLE 1 Literature source of distance factors in globally distributed teams

Distance Factor	**Description**	**Literature Source**
Geographical distance	- Lack of verbal and non-verbal cues - Decreases social interaction and communication -Absence of informal interaction - Loss of information -Increased physical and cognitive taxing - Lack of feeling of teamness - Reduced empathy and trust -In-grouping and out-grouping - Lack of awareness - Lack of feedback giving	Krumm et al., 2016; Zhu et al., 2019; Bataresh et al., 2016; Eisenberg et al., 2019; Alaiad et al., 2019; Hacker et al., 2019; Kaufmann et al., 2019, 2017; Larsson et al., 2020; Light et al., 2016; Darcis et al., 2019; Väyrynen et al., 2018, 2020; Walsh, 2019; Batarseh et al., 2017; Artiz et al., 2018; Mazurek et al., 2016; Snellman, 2014; Marlow et al., 2017; Damian et al., 2007; Bhat et al., 2017, 2016; Morrison-Smith et. al, 2020; Iftikhar et al., 2017; Hinds et al., 2003, 2005; Scott, 2013; Lilian, 2014; Cummings, 2011; Herbsleb et. al., 2003; Ortiz de Guinea et al., 2012; Ågerfalk et al., 2008; Henderson et al., 2016; Krumm et al., 2016; Zhu et al., 2019; Bataresh et al., 2016; Eisenberg et al., 2019; Alaiad et al., 2019; Hacker et al., 2019; Kaufmann et al., 2019, 2017; Larsson et al., 2020; Light et al., 2016; Darcis et al., 2019; Väyrynen et al., 2018, 2020; Walsh, 2019; Batarseh et al., 2017; Artiz et al., 2018; Mazurek et al., 2016; Snellman, 2014; Marlow et al., 2017; Damian et al., 2007
Sociocultural distance	- Reduce level of social support - Language barriers -Different national and organisation cultures - Different communication traditions -Lack of shared identity -Lack of understanding the company value	Lockwood, 2015; Orta-Castanon, 2017; Shaik et al., 2019, 2016; Morrison-Smith et al., 2020; Iftikhar et al., 2017; Marlow et al., 2017; Ågerfalk et al., 2008; Jimenez, 2017; Van der Kleij, 2007; Hinds et al., 2005; Brewer, 2015; Henderson et al., 2016; Brewer, 2015; Zhu et al., 2019; Bataresh et al., 2016; Yu, 2015; Alaid et al., 2019; Wilson et al., 2015; Hacker et al., 2019; Kaufmann et al., 2019, 2017; Light et al., 2016; Darcis et al., 2019; Gaddasand et al., 2020; Tirkkonen, 2019; Wieland et al., 2016; Gugel, 2017; Batarseh et al.,

		2017; Plotnick et al., 2016; Mazurek et al., 2016; Scott, 2013; Holmström
Temporal distance	-Lack of overlapping work hours - Delays in answers -Reduced possibility communicate synchronously -Interruption of communication process - Increased pressure to answer immediately - Overwhelmed feeling due to the increased number of messages	Orta-Castanon, 2017; Morrison-Smith et al., 2020; Iftikhar et al., 2017; Cummings, 2011; Ferrel et al., 2018; Marlow et al., 2017; Ågerfalk et al., 2008; Brewer, 2015; Henderson et al., 2016; Krumm et al., 2016; Brewer, 2015; Zhu et al., 2019; Alaid et al., 2019; Kaufmann et al., 2019, 2017; Light et al., 2016; Väyrynen et al., 2018; Batarseh et al., 2017; Mazurek et al., 2016; Cummings, 2011; Ferrel, 2011; Damian et al., 2007
Communication-technologies	- Unreliable communication-technology -Inconsistent Internet - Too many different communication tools -Information diffusion -Lost information -Lack of knowledge sharing	Iftikhar et al., 2017; A. Ortiz de Guinea et al., 2012; Snellman, 2014; Lilian, 2014; Brewer, 2015; Henderson et al., 2016; Krumm et al., 2016; Brewer, 2015; Yu, 2015; Brown et al., 2016; Wilson et al., 2015; Hacker et al., 2019; Ellwart et al., 2015; Light et al., 2016; Väyrynen et al., 2018; Ferrara, 2015; Tirkkonen, 2019; Wieland et al., 2016; Gugel, 2017: Walsh, 2019; Artiz et al., 2018; Plotnick et al., 2016; Mazurek et al., 2016; Anderson et al., 2007

3.1.1 Geographical distance

Several studies state that geographically distributed teams interact differently than traditional teams. Therefore, they experience higher levels of conflicts (e.g., Hinds et al., 2003, 2005; Scott, 2013; Lilian, 2014; Cummings, 2011; Herbsleb et al., 2003; Morrison-Smith et al., 2020). Table 1 shows that 33 studies recognise that geographical distance diminishes communication quality in some way, which indicates that geographical distance is the most significant distance factor that has a negative impact on communication. Because this thesis reviews the concept of communication as a process, it is necessary to define how this distance factor influence communication.

Chapter 3.1 mentioned that task-oriented and relational interaction are vital to maintain good interaction between team members and to achieve a goal. Virtual teams may face more difficulties in task-oriented and relational interaction compared to co-located teams. Bhat (2017) identifies factors like co-location and nonverbal communication as having the most significant favourable influence on the effectiveness of team communication. Thus, virtual teams need to make additional

effort in communicating the desired outcome. Virtual teams have reduced possibility for direct communication, which can lead to reduced informal interaction, relational interaction and sharing of unconventional ideas in the presence of colleagues (Kauffmann, 2019, 158). In the same vein, Hinds et al. (2003) underline that geographical distribution has a significant impact on task accomplishment and communication process. More precisely, it affects spontaneous communication and shared context (302). Ortiz de Guinea et al. (2012) complement this finding by noting that weak interpersonal interaction and weak information sharing can lead to lack of task awareness. A remote colleague may not be accessible when their knowledge is required, which diminishes input giving and information sharing. Consequently, remote team members might feel that they are kept away from vital information and they do not have access to decision-making processes. Distributed teams are occasionally excluded from decision making, which results in difficulty in receiving task-related information (Ortiz de Guinea et al., 2012). Often teams make decisions outside of formal meetings, resulting in exclusion from spontaneous decision making. The distributed part of the team can also hold spontaneous meetings at a time of day when co-workers from other countries might not be working (Morrison-Smith et al., 2020, 8).

On-site team members also have more chances for informal interaction, which can increase trust between on-site team members. Distributed team members may also engage in informal interaction. However, the frequency of contact with colleagues diminishes in virtual teams (Ågerfalk et al., 2008, 2; Bhat, 2017, 122). Exclusion from any decision making can decrease knowledge sharing between team members. Consequently, lack of knowledge sharing reduces effective task-related interaction. Additionally, it can also reduce trust. In fact, several studies have connected knowledge sharing to trust. It has been argued that knowledge sharing is vital for communication of virtual teams (Marlow et al., 2017; Alsaharo et al., 2017). In order to have an open discussion without fear of judgement, the team needs to maintain a high level of trust. It is vital to all teams to do so, yet Marlow et al. (2017) argue that highly virtual teams often experience reduced trust. A lower level of trust is argued to be a result of a lack of real-time interpersonal and task-related interaction (581).

Moreover, virtual teams can also be imbalanced. This refers to a situation in which communication is inequal because on-site team members have the possibility to communicate both directly and virtually, but isolated team members have access only to virtual communication (Morisson-Smith et al., 2020, 15).

Previous literature appears to indicate that absence of employees and lack of knowledge sharing are key issues that geographical distance creates. Hence, virtual teams are required to coordinate their interaction in order to maintain effective communication. Globally distributed teams have reduced shared working hours, which results in an even greater dependency on coordination. The organisation should provide multiple channels to deliver information and communicate clearly so

there is no room for misunderstanding. Leaders of virtual teams must find replacements for on-site discussion. Communication and information sharing needs to be diverse, frequent and supportive (Lilian, 2014, 1258), thus increasing trust. Well-coordinated, real-time task-related and interpersonal communication enable efficient communication and these elements of communication are vital for shared norms, identity and a sense of teamness (Marlow et al., 2017, 581).

3.1.2 Temporal distance

The following section describes in greater detail communication restrictions that temporal distance might create. Temporal distance can be divided into two main categories: communication delays and time-zone differences. Determining which issues temporal distance creates itself is challenging due to overlapping between geographical distance and temporal distance. However, it is vital to divide these terms for this thesis due to the temporal distribution of analysed teams.

Temporal distance refers to circumstances in which team members are in different time zones. Consequently, they may have difficulties in planning meetings, coordinating activities and creating synchronous communication that requires instant response (Cummings, 2011, 24). Temporal distance has been argued to have a greater impact on communication than geographical distance (Ferrel et al., 2018; Morrison-Smith et al., 2020, 10).

Time-zone differences can create a lack of overlapping working hours. This forces teams to use asynchronous communication (Ågerfalk et al., 2008, 2), which results in reduced interaction and delays in response. Even an hour difference can have a major influence on communication (Ågerfalk et al., 2008, 2; Marlow et al., 2017, 577). Consequently, virtual teams may accomplish tasks slower than co-located teams.

Because of the asynchronous nature of technology-communication in virtual teams, team members might work on other tasks while communicating with team members (Marlow et al., 2017, 577). This can reduce the quality of communication, especially closed-loop communication. As mentioned, effective communication requires both communicators to put personal effort into communication. Different time zones might also create power issues when deciding whose schedule is held and whose workday hours are shifted (Scott, 2013, 303). Scheduling decisions can be made by the majority of team members or the management. Consequently, such decisions might create power imbalance.

A detailed study by Marlow et al. (2017) underlines that communication quality has a more significant impact than the frequency of communication. Therefore, the lack of overlapping working hours would not have such a substantial impact on team communication; in fact, there would be less unnecessary information sharing (Marlow et al., 2017, 578). In contrast to Marlow et al., Morisson-Smith et al. argue that having

fewer overlapping hours increases communication breakdowns, which can lead to false assumptions and incorrectness. Repairing these misunderstandings decrease the effectiveness of communication. To achieve a common understanding between team members, it is vital to include everyone in the decision-making process, but temporal distance makes this challenging. When the temporal distance increases, communication becomes more challenging but not impossible. However, it needs to be well coordinated so that reduced overlapping working hours do not affect communication effectivity. (Morrison-Smith et al. (2020) reviewed literature from several different sources and found that even if the communication process is organised, an unclear message sent by someone from a different time zone can result in the loss of a workday. Therefore, it is possible to argue that virtual team members are required to put extra effort into communication to minimise misunderstandings. Extra effort in communication, however, does not imply weaker communication. Instead, personal effort and choosing the right communication tools have greater roles in communication success.

In a broader perspective, temporal distance enables round-the-clock working and effective information sharing. Organisations are therefore required to provide the right communication tools. In addition to the previously mentioned challenges, Holmström et al. (2006) noted that communication is challenged by temporal distance mainly due to the delays in responses. However, it is necessary to note that even though the chosen literature sources were published between 2015 and 2020, several studies do not acknowledge the potential of instant-messaging tools.

To conclude this section, the literature identifies that temporal distance can create more significant difficulties in communication than geographical distance, leading to reduced quality and frequency in communication. Multiple studies (see Cummings, 2011; Ferrel et al., 2018) show that virtual teams have less face-to-face interaction, more dependency on technology-mediated communication and fewer possibilities to interact in real-time. Communication process, tools and coordination are necessary to achieve efficient communication.

3.1.3 Sociocultural distance

As discussed earlier, communication can be viewed as a tool to achieve a goal. However, in order to understand how to use it a tool, it is vital to be familiar with the communication process in order to use it properly. The importance of fluent communication becomes even more crucial in global virtual teams. According to Trux (2005), multiculturalism means that members of an organisation have different beliefs, opinions and values, which can contradict with each other (3). In addition, members can have values of which they are not fully aware. However, cross-cultural research approaches regarding organisations are often based on essentialist theories, which aim to generalise national cultures in order to understand the specific behaviour and communication pattern of other people (Holmes, 2015, 11). The generalisability of much

published research on this issue is rather problematic. It assigns little importance to individuals' own culture and organisation culture. Essentialist theories like Hall's and Hofstede's often identify specific cultures as productive or talkative. This raises a question of whether identifying a person as a part of culture is even useful. Trux (2005) questions whether there is actually a need for noticing cultural differences. The study indicates that intercultural training for staff aims to foster employees' intercultural competence. Still, it might lead to a very limited understanding of humans and of social interaction and ultimately cause stereotyping and othering. The study conducted by Trux reported that an IT company with international employees did not intentionally acknowledge cultural background. Contrary to the traditional cross-cultural approach, this indicates that multinational companies do not necessarily need to implement particular communication strategies to make their team work better (Trux, 2005). Management without the notion of culture can be trusted and create a workplace that is free of discriminatory behaviour (Trux, 2005, 4).

In contrast to the study by Trux (2005), there has also been some disagreement concerning the definition of culture and if national culture has an impact on the interplay between globally distributed team members. The study of Daim et al. (2010) is complemented by Morisson-Smith et al. (2020) that cross-cultural virtual teams seem to experience difficulties in maintaining functional communication, and teams are not able to benefit from advantages that diversity creates. A recent systematic literature review by Morrisson-Smith et al. (2020) concluded that team members from individualistic cultures have greater trust in other team members when they use communication technology, while those from collectivist cultures experience increased trust when the interaction is face-to-face. In addition, Morrison-Smith et al. (2020) argued that people from individualist cultures interact more precisely. In addition, they aim to respond to equivocal messages. Moreover, groups with increased sociocultural distance have more communication conflicts compared to on-site teams (Morrison-Smith et al., 2020, 17). This analysis is complemented by a study by Damian et al. (2007) which holds the view that national and organisational cultures challenge communication between team members and differences in cultures diminish trust between team members. Again, these studies take an essentialist approach to the culture in which the reason for miscommunication or ineffective communication can be found in the culture. Both studies claim that teams that are separately located have issues with different languages and cultures that can result in misunderstandings and interpretation problems. These problems can diminish relationship development, which can result in an us-versus-them mindset. Hence, sociocultural distance can diminish shared understanding and interaction (Scott, 2013, 303).

Team members might create in-group and out-group categories between each other based on similarities, shared preferences and worldviews (Bataresh, 2016). The frequency of communication increases between in-group members, and consequently, the out-group member might be left out of decision making and interaction (Bataresh

et al., 2016, 6). Increased out-grouping may create a harmful platform for reduced trust, othering and blaming teammates who do not share high trust. However, it is unclear what causes in-grouping and out-grouping. Other observations would seem to suggest that geographical distance and digital communication increase this tendency. Shared worldview as an indicator for in-grouping suggests that sociocultural distance increases othering. The evidence is not conclusive. Previous observations fail to acknowledge the impact of factors like team size or team formation.

In addition, often geographically distributed teams face a lack of familiarity, which can result in a diminished feeling of teamness and trust and increase misunderstandings, especially in task-related interaction (Ågerfalk et al., 2008, 2; Marlow et al., 2017, 580). This view is supported by Herbsleb and Mockus (2003), who reported in their analysis of medium-sized teams that the feeling of teamness was reduced significantly when team members were distributed.

Regardless of the possible risk of increased misunderstandings due to language or cultural differences, diversity of team members can lead to better knowledge sharing and common understanding if the quality of communication is high (Marlow et al., 2017).

Sometimes virtual teams are challenged by institutional differences. Globally distributed teams often represent one organisation, but their local environments and cultures may differ. Consequently, different goals, frameworks, goals, performance, expectations and even personalities may create conflict between distributed team members (Jimenez, 2017, 344).

Additionally, it has been widely addressed that language barriers are one of the biggest reasons for misunderstandings in globally distributed teams. Non-native language use can lead to misunderstandings, lack of in-depth communication and reduced information sharing (Van der Kleij, 2007; cited Gibson & Cohen, 2004). Previous literature is yet again primarily concerned with external factors rather than internal factors of global virtual teams. The previously mentioned issues can be found within on-site teams as well. The studies listed in Table 1 do not acknowledge internal factors. In distributed teams, however, missing contextual information is likely to make it more difficult to identify real communication problems.

3.1.4 Communication-technology

In this study, the digital communication environment is defined broadly. According to Sivunen and Laitinen (2020), a digital communication environment includes access to information-sharing possibilities for private interactions between team members and the possibility for open discussions and content sharing (43). These environments can be used in various ways, and employees should have access to these environments from different locations (Sivunen & Laitinen, 2020, 43).

Teams that use videoconference and chat display lower levels of constructive interaction compared to co-located teams that can interact on-site, and therefore globally distributed virtual teams struggle with communication challenges due to the use of electronic tools (Väyrynen et al., 2018, 2). However, communication technologies create several advantages, like the possibility to work in parallel and therefore expedite completion of the project faster. These teams also have the possibility to organise their knowledge electronically and access different communication tools (Suchan et al., 2001, 176).

Communication technology is constantly changing and enables various ways to share information; however, technologically mediated communication between team members may create problems such as misunderstandings, information diffusion and lack of knowledge management (Lilian, 2014, 1258). Due to the reliance on electronic communication tools, virtual teams are highly exposed to conflict factors like stress caused by deadlines and timetables (Snellman, 2014, 1258). Managers need to choose the appropriate communication technology solutions for the needs of the team based on how and when the tool is used (Daim et al., 2012, 205).

According to prior literature, decisions of which communication tool is most suitable for the team differ significantly. Virtualiness has a different impact on a team depending on whether the team is temporal or has been working longer together. Temporal teams require highly functional communication tools combined with communication norms (A. Ortiz de Guinea et al., 2012; Lilian, 2014). Sivunen and Laitinen (2020) argue that the acceptable method of communication and the use of communication tools can be affected by cultural context. Henderson (2016) supports this claim, showing that technology and how it is used are crucial to teams' collaboration. The predominance of email created an increased number of miscommunications and misunderstandings between team members (1726). In the same vein, Damian et al. (2007) argue that discussion via emails increases information overload. The group size may also affect the media choice. Indeed, while a smaller team benefits from audio tools, chat conversations are significantly more useful for large teams. Moreover, larger teams do not benefit from parallel audio groups due to the limited possibilities to share knowledge (Löber et al., 2007). This topic will be further discussed in sub-chapter 3.2.

Constant access to digital communication environments creates concerns such as continuous connectivity and assumption of employee flexibility. Easy accessibility to co-workers might also create interruption in the form of notifications (Sivunen & Laitinen, 2020, 45). This might be especially true in globally distributed teams because they may feel pressure to answer immediately (Sivunen & Laitinen, 2020).

Increased reliance on electronic communication is also related to geographical distance. As mentioned earlier in the thesis, communication technology suffers from lack of non-verbal and verbal cues, which is harmful for human interaction and can result in false assumptions and false contradictions of what is being said (Daim et al.,

2012, 203). Yet, increased use of videoconference and instant-messaging tools seems to increase cognitive effort and knowledge sharing from team members, leading to a higher quality of communication (Daim et al., 2012, 205).

Marlow et al. (2017) claim that increased virtuality diminishes communication efficiency. Because of technology-communication media, teams must spend more time determining how to decrease irrelevant information. Despite all this, the virtual team has the possibility to communicate in well-coordinated and effective ways which are not possible in co-located teams. This enables, but also requires, round-the-clock working and a need to work in sync with all team members.

In summary, the use of communication technology requires good coordination and a closer look at team size. Studies on the impact of distance on communication are numerous. There are even several explorative studies to predict how the communication process is disturbed by these factors. Still, with few exceptions, the literature lacks more in-depth analysis on the impact of internal issues like team size or management approach, and more precisely how these factors influence distance factors and the communication process. This thesis aims to contribute to the literature by identifying the real impact of team size on communication in global virtual teams and how group size influences distance factors. The next two sub-chapters take a closer look at how the size of the team and the impact of a Scrum framework influence communication in globally distributed teams.

3.2 Impact of the team size on communication

Team size is an essential factor in virtual teams which should be considered in the creation of a new team. To achieve a shared understanding, team members should be able to have an in-depth conversation and the possibility to participate actively. To achieve high-quality group discussion, a team need to generate multiple perspectives, share knowledge, and define and understand the problem at hand (Lowry et al., 2020, 634). While other distance factors have been widely studied to understand communication in virtual teams, team size has not been studied in the same manner. Temporal, geographical and sociocultural distance factors might have an impact on communication, but perhaps this impact can be diminished to a minimum by having smaller teams. Previous studies of the impact of team size indicate that size might actually affect communication more than has been predicted. Indeed, issues like coordination problems, lack of knowledge sharing, reduced feeling of teamness and familiarity, which geographical, temporal and sociocultural distance are said to cause, seem avoidable with smaller team size.

Effective communication requires active participation, but large virtual teams, in contrast to small virtual teams, require more effort in collaboration to achieve shared

understanding (Anderson, 279, 2006). A large information load can result in increased interruptions and misunderstandings (Riedl, 2012). Moreover, although larger teams have more diverse expertise and skills, team members have fewer opportunities to participate in the conversation (Bradner et al., 2005, 2). In fact, larger teams do not benefit directly from the diverse knowledge and expertise within them (Riedl et al., 2012). Hare (1952) showed that in co-located teams, when the team size increases from five to 12, the degree of consensus which results from a discussion decreases significantly. Hare's study is supported by Bradner (2015), who found that smaller teams were more aware of their goal and familiar with team members' personalities. Most importantly, reduced team size increased the willingness to communicate and diminished coordination issues such as agenda setting. Additionally, Lowry et al. (2020) found that increased group size decreased the quality of discussion significantly compared to a smaller team, and even though larger groups gain in experience and knowledge, a complex project may actually benefit more from smaller teams. An explanation for this is that small teams involve increased appropriateness, openness, richness and accuracy (Lowry et al., 2020, 657).

Furthermore, if the organisation has several teams, the diverse group size may affect the media choice. While a smaller team benefits of audio groups, chat conversations are significantly more useful for large teams. Moreover, larger teams do not benefit from the parallel audio groups due to the limited possibilities to share knowledge (Löber et al., 2007). However, Kinney and Watson show that chat groups require more time to achieve a task. In addition, teams would benefit even further from the use of email, which is claimed to save time and increase documentation (El-Shinnawy et al., 1944).

Taken together, previous studies about virtual teams support the notion that geographical, temporal and sociocultural distance diminish the quality of communication. However, researchers have tended to focus on external factors like location and time rather than on internal problems. Such approaches have failed to address issues like the size of the team. Hinds et al. (2013) indicated that research would be more relevant if it recognised the team size, even though it is reasonable to expect that increased size has a negative impact (629). In the same vein, Alaiad et al. (2019) note that several reviewed studies did not mention the size of the team and its possible impact on the communication between team members and on the reliability on the research results (230). This view is supported by Anderson, who reports that a virtual team with several team members and lengthy meetings faced difficulties in communication and stated that this phenomenon is related to social loafing, referring to the fact that members of a larger group tend to give less effort compared to those in smaller groups. However, this tendency can be influenced by communication technologies (Anderson et al., 2007, 2575). Anderson et al. (2007) claim that social loafing could be the result of technology use rather than the size of the team.

The study found that when smaller teams increased the number of team members, larger teams with shared facilities had more discussion (Anderson et al., 2007, 2575). This reasoning might be insufficient. In large teams, communication might be active and there is more discussion, but simultaneously it becomes vague and unstructured when there are several communicators (see Figure 1). Consequently, the team suffers from lack-of in-depth discussion, which can decrease communication effectivity (Hoegl, 2005).
All in all, it is safe to claim that traditional distance factors alone do not determine the effectiveness of communication. Team size seems to have an impact on communication and it has possibility to increase effectivity of communication practices, which should be noted by the team management. However, it should be noted that the management approach of the organisation might have an impact on communication as well. It can determine the communication process and give a framework to it. Therefore, in this thesis, it is necessary to take a closer look at the Scrum framework, which is used in the observed organisation.

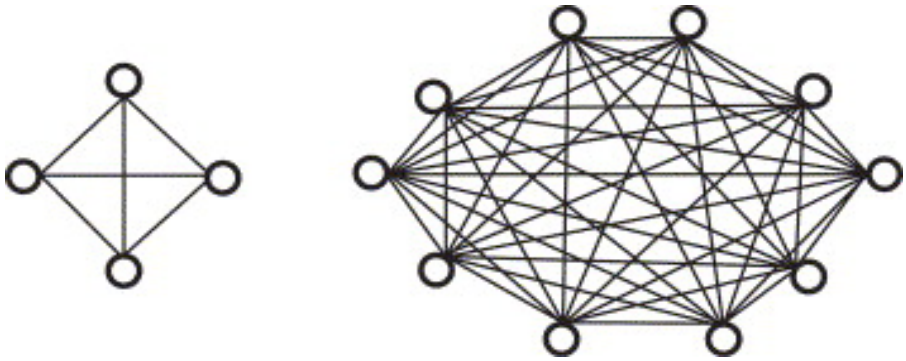


Figure 1 Large teams make it harder to communicate: full communication structure with 4 and 10 members (based on Hoegl, 2005)

3.3 Impact of the Scrum on communication

To understand the communicational background of studied teams, it is necessary to define the concept of Scrum and how it influences communication. Scrum is a framework which is mainly used in the software development industry. However, its use has expanded outside of the technology world (Waltmunson, 2011, 25). Karabulut and Ergun (2018) define the concept of Scrum as a tool which offers team-based management to succeed in a fast-changing industry. It can be used in several fields, like service, school and marketing, organisational operations and software development (Karabulut & Ergun, 2018, 110).

Primary activities of a self-organising Scrum team are Sprints, Spring Planning meetings, dailies and review meetings, which should deliver a product for a customer (Cervone, 2010, 20). A team contains a team leader, a Scrum Master, a product owner and team members. The leader provides goals and resources and a business plan and is accountable to higher management (Karabulut & Ergun, 2018, 111). However, the founders of Scrum, Schwaber and Sutherland, do not recognise the team leader as a part of the Scrum team. A Scrum Master is comparable to a team leader who is directly accountable to the product owner. Their main tasks are to coach the team, protect the team from interruptions and make the work visible (Karabulut & Ergun, 2018, 111). The presence of a Scrum Master is crucial for the project's success because he or she makes sure that interaction between team members is fluent.

Communication plays a crucial role in software development practices, and several studies claim that developers rely highly on informal and ad hoc communication, along with formal project communication (Layman et al., 2006, 782). Layman et al. (2006, 781) claim that communication, and mostly informal communication, plays a crucial role in the success of a team. As mentioned earlier in the thesis, issues like cultural and language differences, trust, feedback loops and asynchronous communication create difficulties in software development processes. Failure to fully understand system features and inability to solve problems cause budget variance and, in the worst case, damage client–supplier relationships (Layman 2006, 782). These misunderstandings can result in dissatisfaction between management and employees (Henttonen & Blomqvist, 2005, 108).

Scrum, as a framework, has been mainly discussed and reviewed in the field of technology and finance. Still, the impact of Scrum practices on communication has only been examined in a few case studies. Scrum is claimed to be able to deal with high complexity where the environment, markets and technology are continuously changing. Several studies show that the main issues in software development have been that production is often very time-consuming and often has quality issues. In addition, it often costs too much. It has been suggested that Scrum could solve those problems, improve communication and shorten the development time (Pikkarainen et al., 2008, 303). There is a low level of hierarchy, and Scrum Masters do not dictate what to do and when. Instead, their main job is to protect the team. The team members can choose their tasks, and therefore the communication should be transparent and effortless.

It is vital to note that previous studies of agile practices do not often recognise cultural differences, which is problematic, especially when the organisational culture does not get needed attention and analysis. Often, analyses recognise that physical separation has an impact on communication, but other factors like cultural background, language proficiency and training receive little or no acknowledgement (Herbsleb & Mockus, 2003, 491). However, Hollmöström et al.'s (2010) study of a software development team's communication acknowledged temporal, geographical and

sociocultural factors. The authors highlighted the positive connection between Scrum practices and communication quality, and the Scrum framework was noted to increase communication and coordination. It was even claimed to increase the feeling of teamness. The most likely cause of this is the increased face-to-face discussion via videoconference tools combined with higher participation in the project.

It has been argued that Scrum should enable a higher quality of communication. Interestingly, research on offshore development software companies that are using Scrum shows communication is still the primary issue (Cervone, 2010, 22). Even when Scrum is used, global distribution seems to cause communication, temporal, geographical and cultural challenges. Several studies (see Sahar et al., 2006; Herbsleb & Mockus, 2003; Layman et al., 2006) show that, despite the use of Scrum, geographically distributed teams take 2.5% more time to complete a project than a project that is on site. Perhaps the most severe disadvantage of the Scrum-based approach in project management is its simplicity. That raises a question of why a framework that is based on increased face-to-face discussion via videoconference tools combined with higher participation in the project is not able to increase communication efficiency. Karabulut and Ergun (2018) indicate that agile methods like Scrum are designed for small, single-team projects and benefits of Scrum are challenging to implement in large projects. Larger agile causes distance between stakeholder and teams, which makes communication and cooperation challenging. Similarly, Pikkarainen et al. (2008) found in their quantitative study that developers in particular had challenges with organising sprint planning meetings, because they were not encompassing considering the requested prerequisites (Pikkarainen et al., 2008, 319). Overall, the Scrum framework seems to increase participation, but it does not solve communication issues that are caused by communication distance factors. Team size seems to have a more significant impact on the communication process than the management framework.

In summary, the Scrum framework may increase the quality of communication, but it does not provide a significant advantage, especially in the communication between management and the team.

4 RESEARCH DESIGN

The thesis aims to provide useful information for the field of project management and communication regarding internal communication in the globally distributed virtual team. The research provides more in-depth insight into employees' and employers' perceptions of internal communication, which communication challenges they experience and how these issues can be reduced. The purpose of this study is to investigate the effect that team size has on distributed teams. Therefore, the first research question is the following:

R1: How does team size influence communication distance factors in globally distributed teams?

It has been widely argued that efficiency and quality of communication are negatively influenced by different distance factors. As discussed in the literature review, temporal, sociocultural and geographical distance can create several issues in communication. However, much of the research up to now has focused very little on the connections between the team size and communication distance factors. Therefore, it is vital to define the impact of team size on communication distance factors, and especially which aspects within distance factors are influenced by the team size. In fact, it can be argued that traditional communication distance factors do not necessarily have as great an impact on the quality of communication as has been predicted. The issues caused by distance factors can be reduced with a deceased number of team members. Failure to address the impact of the team size on communication distance factors can be seen as a significant drawback.

The thesis aims to identify which communication practices are affected by team size. A reduced team size can be argued to be the basis for the quality of communication. Therefore, the second research question is the following:

R2: How is group size reflected in teams' communication practices?

The communication process includes communication practices. To achieve effective communication, three aspect needs to be fulfilled. The definition of effective communication of Marlow et al. (2016) is used in this thesis. The three communication aspects are communication frequency, communication quality and communication content. As mentioned earlier, quality of communication is influenced by distance factors in virtual teams. Therefore, it is possible to assume that communication practices are influenced by these factors too. The thesis aims to identify which aspects within distance factors affect communication practices, and therefore are influenced by team size too. While previous studies of communication in co-located teams show that smaller teams have a better quality of communication, there is little research about how the group

size influences communication practices in globally distributed teams. Few previous studies (see Hertel et al., 2002, Daim et al., 2012) indicate that large team size might have a negative impact on team participation in virtual teams too. In fact, participative communication has been identified to be the strongest indicator of effective communication. It enables a better understanding of the objectives (Daim et al., 2012, 207). It is possible to expect that the team size might influence other communication practices in globally distributed teams.

4.1 Research context

The study was conducted of the subsidiary of a multinational company group with its headquarters in Germany. The researched company produced software services. For the clarity of the thesis, the subsidiary is referred to as a company.
The company used outsourced companies located in Argentina and Belarus. Working in a distributed team is common in the field of software development because of the possibility for wider access to qualified employees regardless of their location. The company has a bigger project, and within this project are several smaller projects. This thesis focused on two smaller projects which support the bigger project and, therefore, a broader goal. These projects were chosen because they shared the same work framework (Scrum) and sprint times, which made them comparable. In both projects, teams included new and more experienced employees. Experience of working in virtual teams varied between participants. It is vital to note that this might have an impact on the thesis outcome.

Both teams were globally distributed virtual teams. Project 1 aimed to develop an application, and the main goal of the project was to distribute it rapidly for internal use and market. The project team consisted of 17 people from three different countries. The team included a Scrum Master, 12 developers, two QA and a Product Owner. They used the Scrum method as a framework for their work. In addition to the core team, management from the United States, the head of intralogistics, the head of service, the CFO of the group concern and CEO of the studied organisation were included in the project. The size of the team varied over the course of the research, which is common in the industry. The interviews were conducted at the end of June when the team had 17 members. During the spring the team initially included 11 members. However, six employees joined the team later because they were in the other project, which was eventually cancelled. Seven team members are researched in this study, and three of them are also team members in the other researched project.

Project 2 is one of the company's and group's main projects. The development of the product of Project 2 is also very complex, and it has several requirements. During interviews the core team included five developers and one QA, and they used the

Scrum method to achieve the goal of the project. In addition, the project had a project manager and an occasional Scrum Master. Interestingly, the team did not have an official Scrum Master at first, but eventually they got support from a person with Scrum Master experience, because the team aimed to improve team meetings. This person was able to give support and coaching to adopt the Scrum framework. Eventually, the Scrum Master joined the team. The size of the team varied during the research period, and at the end of the research, the team gained two new team members. However, one of them had been interviewed earlier for Project 1. Because the interview was conducted in June, five people took part in the research. One of them was also team members in the other researched project.

Table 2 Background information Project 1

	Position	Location	Length of interview
Team member 1	Employee	Argentina	1h4min
Team member 2	Employee	Argentina	1h
Team member 3	Employee	Argentina	1h8min
Team member 4	Employee	Belarus	50min
Team member 5	Employee	Argentina	1h
Team member 6 (+ member of Project 2)	Manager	Germany	1h53min
Team member 7	Manager	Germany	1h2min

Table 3 Background information Project 2

	Position	Location	Length of interview
Team member 1	Employee	Argentina	58min
Team member 2	Employee	Argentina	1h5min
Team member 3	Manager	Germany	45min
Team member 4 (+ member of Project 1)	Employee	Argentina	53min
Team member 5	Manager	Germany	Interview was conducted in written form

At the beginning of the research, due to COVID-19, all team members were located in home offices, but normally some of the team members are located in the same office. On a daily basis, all employees have also the possibility to work from home if they want. During the observation period, the German team was able to work from the office again. Everyday meetings took place via videoconference tools. Therefore, COVID-19 did not directly affect the scheduling of team meetings. It is noteworthy that some of the company's internal interaction took place in the office without distributed employees, which can influence communication.

As mentioned before, the organisation uses Scrum as a framework. Team members have the possibility to find information about Scrum from the website Scrum.org and from a collaborative workspace, which they use for documentation. The website emphasises that the Scrum is not a methodology, which was also the approach of the management. Yet, there is an inconsistency with this argument. In fact, some researchers describe Scrum as a project management tool or methodology rather than as a framework. The company provides a template on how to organise a Sprint, which was planned to maintain effective communication and working. In order to reduce complexity and increase communication, all Scrum teams should have started and ended at the same time. It is vital to note that only the length of the Sprint and the day of review were shared, but otherwise, teams have their organisation and timelines.

4.2 Methodology and data collection

Globally distributed teams can be studied in several ways, and a quantitative approach is often used to understand the communication of virtual teams. The quantitative approach often enables the researcher to determine whether the communication is good or not. However, the interest of this thesis was in the communication process. Therefore, a qualitative approach was chosen to give a better understanding of how the communication process occurs in virtual teams, and more importantly, how the team size affects this process.

The study aims to research a specific phenomenon in its context and to explore a single group within a research context. The baseline of the thesis is constructive because knowledge can be gained during the research process. More precisely, participants are understood as human beings who produce different truths in their social context (Koppa, 2020). The constructive view acknowledges the human as an actor who modifies society but is simultaneously modified by it (Murphy, 1997). Thus, the study aims to understand the view of individuals and how they perceive the communication process of the team.

The methodology was chosen to understand the view of team members. That is why a mini-ethnographic case study was used in the thesis. It allows for more in-depth insight into real-life communication problems. It enables an in-depth discussion of how distance factors affect communication and rules out the possibility of misunderstandings that could appear in a quantitative study. Case studies have their limitations. All presented findings are context-specific, and all possible effects on internal communication are dependent on the specific factors (Pikkarainen et al., 2008, 331). As in every case study, it is not possible to ensure that the results can be generalised outside of the research situation (Layman 2006, 792) because some potential factors may affect internal validity. A study by Layman highlighted that participants might act

differently under observation than they would typically (Layman, 2006, 792). However, Pikkarainen et al. (2008) were able to diminish this problem:

> "The collaboration between the researcher team and the case company representatives was close and continuous during the overall research period. That enabled good access to the project information and possibilities for collecting evidence from several sources." (Pikkarainen et al., 2008, 33).

Evaluating team communication requires analysis of how the team perceives it (Raappana & Horila, 2020, 35). The thesis is a case study, but to understand the actual communication process of researched teams, online ethnographic methods were used in the study. A case study benefits from ethnographic methods because it emphasises the action of participants in a real-life context. Online ethnography methods are one of the most practical ways to reveal relationships, connections and conflicts between individuals and teams (Rahm-Skakeby, 2011, 425). Among the characteristics of empirical data are that they illuminate conflicts, such as what is causing them, how they are dealt with and the difficulty of the conflict (Rahm-Skakeby, 2011, 425). That approach is significant for the thesis. Therefore, case study and online ethnographic methods support each other.

Entirely ethnographic research was not possible to conduct, because it often requires a more extended time period to observe participants, and often ethnographic researchers do not base their study on previous theoretical models (Sivunen, 2007, 59). A mini-ethnographic study allows the research to be conducted within months (Fusch et al., 2017, 926). However, not all ethnographic methods were possible to use in the data collection. Therefore, online ethnographic methods were not solely used in the thesis. The purpose was to support the case study, which aims to explore processes and views (Koppa, 2020).

According to Rahm-Skakeby (2011), online ethnographic data collection methods include document collection, online observation and online interviews. Fusch et al. (2017) define data collection methods as fieldwork with direct observation, a reflective journal, and online interviews. This study combined observation with a reflective journal and semi-structured interviews methods to gain an understanding of how members of the global virtual team communicate with each other and how distances affect communication effectiveness. The main focus is on the data of semi-structured interviews, and online observation aims to support the collected data.

> For qualitative field research, ethnography involves learning the feelings, beliefs, and meanings of relationships between people as they interact within their culture or as they react to others in response to a changing phenomenon for the research takes place within the culture. (Fusch et al., 2017, 925)

To understand the organisational culture, the researcher becomes part of the team and culture that he or she observes (Fusch et al., 2017, 925). The researcher needs to achieve a high level of trust to observe interaction and conduct open and honest interviews (Fusch et al., 2017, 925). Participation in daily (remote) interaction with team members enabled the creation of an open atmosphere with participants. It is vital to note that subjectivity and researcher bias are prevailing in a mixed-method like a mini-ethnography and in case study. Especially how perspectives of other people are understood are difficult (Fusch et al., 2017, 927). Therefore, it is vital to note that the researcher has in this kind of studies a key role in data collection (Fusch et al., 2017, 927). The mixed method can be, anyway, useful method to not only to understand how the communication process is in virtual teams but also understand why people communicate in that way in their environment.
The following sub-chapters give an overview of two data collection methods that are used in this thesis.

4.2.1 Observation

Observation enables us to understand how people interact with each other and integrating observation with interviews enables verification of the data assembled through observation (Scott, 2013; cited Lindlof & Taylor, 2002).

Research perspectives are based on three observing dimensions: open, partly open and hidden observation (Rahm-Skakeby, 2011, 414). Open observation was used in the data collection, increasing researcher–participant trust. If the observation is used as primary data, then trust can be damaged if the researcher decides to use a discreet manner (Rahm-Skakeby, 2011; Skitka et al., 2006). However, in the study, online observation was used as a supplementary method and as a basis for interview questions, and notably, the data did not include anything personal or sensitive (Rahm-Skakeby, 2011, 414). The observation data conducted an overall observation of team discussion and communication in the instant message application and online meetings. In observational studies, there is a potential for bias by the researcher because the primary data collection instrument is the researcher (Fusch, 2017). It was not possible to investigate the whole organisation, and therefore the selection of the analysed team was based on the researcher's choice, which may have created bias.

Online observation provides an understanding of the frequency and style of the communication, the effectiveness of the communication and how team members communicate with each other. There was a possibility to get access to all meetings of two projects, which provided opportunities to observe team interaction daily.

Meetings that were observed were traditional Scrum meetings and included Sprint planning, Daily meetings, Grooming and Sprint Retrospective. Sprint Review

was not observed in the thesis because the meeting included review of progression of all teams.

Sprint Review, Grooming and Retrospective typically take place every two weeks, before and after Sprint end. The length of one Sprint was usually two weeks. Exceptionally, during the observation, Project 1 had one longer Sprint due to holidays. The aim of Sprint Planning is to define the work together with the whole team. Traditionally, for a two-week Sprint, the team should not hold a meeting longer than four hours. The Scrum Master ensures that the event takes place and that attendants understand its purpose. Additionally, they make sure that the meeting does not extend the original time frame. However, in this thesis, observed teams aimed for an hour of timeboxed Sprint Planning. Meetings took place by videoconference tools Lifesize and Google+ Meet.

Observation of team meetings gave the chance to see how team members interacted and how global distance factors affected communication. Observation notes were used during the data collection, and they were represented by journaling. They are field notes that capture what one observes (Fuchs, 2017), which enables the researcher to identify themes in the data. Due to the privacy policy of the researched organisation, the content of conversations cannot be mentioned in the thesis. As explained, a reflective journal was used together with observation notes. According to Fusch et al. (2017), journaling can also be defined as a reflective process in which everything that could be observed is written down and then reflected on to identify themes and patterns from the observations. Reflective journaling of observations included mostly data about communication process and communication issues that the teams experienced. Due to the focus of the thesis, global distance factors, including geographical, sociocultural, temporal distance factors and communication technology, received additional attention during observation.

4.2.2 Semi-structured interviews

This study was conducted through semi-structured online interviews together with observation. Interviews were used as primary data as they give in-depth information and data on people's perceptions. Interviews are often used in mini-ethnographic case studies, and often they are informal or unstructured interviews (Fusch et al., 2017, 930). According to Rahm-Skakeby (2011), in the online ethnography, online interviews are performed via either instant messaging or email (Rahm-Skakeby, 2011, 416). However, face-to-face semi-structured interviewing was used in this study, and therefore it was possible to overcome limitations of unstructured computer-mediated interviews. Interviews on video conference tools hinder limitations like lack of emotional and empathic communication and asynchronous communication (Rahm-Skakeby, 2011). Therefore, limitations of online ethnographic interviews like lack of non-verbal

behaviour, manufacture of online identities and lack of in-depth replies were minimised. Participants of the study could answer via email or instant messaging; however, all except one chose to have a face-to-face online interview. The online interview has fewer geographical and distance limitations, which enables better reach of participants (Rahm-Skakeby, 2011, 417). As mentioned in the chapter 4.1, interview questions were based on observation and previous studies about distance factors in virtual teams. Employees who were willing to participate were contacted a week before the meeting. A suitable slot was scheduled with each participant and all the 11 interviews being conducted in June 2020. Due to the time zone differences and tight time schedules of employees, the aim was to keep interviews as short as possible. For each interview allocated time was 75 minutes, but an interview took approximately 60 minutes. Due to the geographical distance, interviews were conducted via Skype or Google+. The interviews were transcribed in detail into text-files, but later edited so, that some meaningless expletives and pauses were removed. Interviewees did not know who else took part in the research in order to maintain privacy of each participant.

For the reliability of the study, it was necessary to minimise the possibility for misunderstanding about concepts (Fusch, 2017; Carlson, 2010). Therefore, the interview included 10 main questions. They were provided 24 hours before the interview to diminish language-related misunderstandings and increase sensemaking. Participants could use a dictionary during the interview and have questions phrased in another way in case they did not understand the original question. It was necessary that main concepts were clear to participants. This is crucial for a case study because the time to achieve shared understanding is limited (Fusch, 2017, 931). Each question consists of four to seven sub-questions. However, some questions were sometimes skipped because they had been answered already. Additional follow-up questions were asked if questions were not fully answered or if something interesting related to the subject arose from previous answers.

The interviewees were encouraged to interrupt and to add or ask anything during the interview. The interview was semi-structured, and therefore, interviews were not all the same. The interview questions were based on previous studies about global virtual teams and observation of the team interaction, allowing for detailed and useful answers on the thesis topic. Distance factors were used main concepts. Therefore, the first five questions covered temporal, sociocultural and geographical distance together with communication technology. Questions six to nine are based on Muszyńska's (2018) study of communication effectiveness. The thesis used questions regarding different aspects of communication effectiveness. These questions aimed to provide further information about teams' communication process. Answers to the questions enable identification of whether aspects of communication efficiency are fulfilled.

Background information of participants was collected to provide descriptions of each respondent. They include relevant characteristics regarding the topic, such as

nationality, duration of employment and the position in the team. This study refers to participants using the pronoun 'they', regardless of the gender of the participant. Defining gender was not applicable to this study, and gender definition might have affected data privacy due to the limited number of female participants.

The chosen number of interviews is based on a study by Galvin (2015) which shows the probability of the theme being presented in a sample of interviewees, given the percentage of the target population in whom the theme exists (11). The study also assumes that the sample can be valid when it is a random sample of the population (Galvin, 2015, 11). To be clear, this thesis does not claim any clear causality. Due to the nature of the qualitative research, the thesis does not aim to generalise.

4.2.3 Data analysis

Analysis of the data was performed using qualitative thematic analysis, which enables data reading in order to identify themes that occur in the thesis. This method is frequently used in qualitative analysis because it is a general and flexible method (Rahm-Skakeby, 2011, 419). In this study it is appropriate because it is primarily used to assist in analysis to support the method (Lorelli et al., 2017), and ethnographers have widely used it for the analysis of interviews and unstructured observation data (Williamson et al., 2018). With the thematic analysis method, there is the possibility of finding key features of the data set. The method is useful for highlighting similarities and differences and for summarising key features of a rich but complex set of data (Lorelli et al., 2017, 2). For these reasons, the thematic analysis is the most practical choice.

The research focused on a particular aspect within the data. The study identified themes that occurred in the interviews related to the impact of team size on geographical, temporal, socio-cultural and communication technology distance factors. Each theme related to topics found in the literature review (Table 1). Theoretical background and thesis questions determined how, and the data was coded. Hence, a deductive approach was used to answer the thesis questions. Deductive or theoretical analysis is driven by the theoretical interest in the researched area, and the description of the data is rather narrow, but more in-depth in the analysis of specific aspects of the data. This thesis focuses on a particular feature in the data – the impact of team size on distance factors and communication processes in virtual teams. The generation of themes was based on previous literature and the assumption that the distance factors mentioned in earlier studies actually exist. Generated themes are thus predicted to be part of one or several distance factors. With generalised themes, one can determine how team size impacts these factors and how these themes affect communication practices in virtual teams. A deductive approach, therefore, might enable a critical view of the current literature about communication in virtual teams. Notably, even though the interview questions included direct questions about distance factors, they did not

determine themes per se, but instead provided frames for the data collection, because the aim was to identify which aspects within these distance factors are influenced by team size. This for one's part can show how the team size might affect communication practices.

This research was conducted within a constructionistic paradigm because it did not focus on motivations but aimed instead to provide information on structural conditions (Braun & Clarke, 2006). Some factors other than team size might affect these distance factors as well, and the impact of an individual prediction is noted in the analysis. In a real-life context case study, it is difficult or even impossible to create generalisable assumptions.

This study followed a six-step framework of thematic analysis: familiarisation with the data, generation of initial codes, indication of themes, review of themes, definition of themes and the writing phase (Braun & Clarke, 2006; Lorelli et al., 2017; Nejat et. al., 2017).

Familiarisation with the data included textual data, which can come in various forms including observation, reflexive journals, texts and documentation (Lorelli et al., 2017, 5). As mentioned earlier, the data used in this thesis consists of observation and semi-structured interviews. Interviews were transcribed using denaturalised transcription, which is highly relevant for an ethnographic approach. The focus is less on accent and vocalisation matters and more on the substance of the interview (Oliver et al., 2005).

The second phase began after the familiarisation with the text. The process used in this phase is called coding, and it ensures that the research identifies parts of the data that will form the basis for the themes (Lorelli et al., 2017, 6). Qualitative coding is a process of reflection which focuses on specific characteristics of the collected data, and therefore the data becomes more structured and provides an idea of what it includes (Lorelli et al., 2017, 5). This thesis aims to answer specific research questions, which provided a framework for the data collection. Hence, the collected data needed to be relevant to the research questions. Research bias might have influenced the coding, resulting in some important codes not being noticed. The second part involved combining both observation and interview data in order to identify a pattern revealed by the findings. Prior to analysis of the data and identification of thesis-related codes, the transcripts were checked for specific characteristics that arose from the interviews. Transcriptions were separated into four groups, each representing one communication distance factor. The separation was based on the conclusions of previous studies regarding which aspects can be identified as being caused by distance factors. This stage of the analysis revealed a major problem: sometimes interviewees did not mention whether they were talking about their team specifically or were making assumptions about the nature of communication in virtual teams. It was vital to identify whether the interviewee was talking about the researched team or if they were making

assumptions on a general level. Consequently, at this stage of the analysis, unclear statements were omitted.

The third phase involved searching for themes, and it took place when all the data was coded. Themes are often meaningless without a context, and they are identified by bringing components together. They capture essential parts of data which are relevant to research questions (Lorelli et al., 2017, 8), and a theme can be based on the raw data or theory and on a research question (Lorelli et al., 2017). As this thesis takes a theoretical approach, the research comprised a deductive analysis, which offers a less rich explanation of the overall data and a more comprehensive analysis of particular aspects of the data (Braun & Clarke, 2006, 84). The generated themes address the first research question about how team size affects communication distance factors and especially in which way it does so. These founded aspects or themes also reveals how they affect communication practices, which provides an answer to the second research question.

The fourth phase involved a review of the themes. Due to the high amount of collected data, this phase was crucial for the thesis. During this phase, a researcher can determine whether some of the data is too diverse or whether there is not enough data to support the theme (Braun & Clarke, 2006, 91). According to Braun and Clarke (2006), for one to identify coherent teams, they need to be distinct from each other. The review of themes revealed some that did not answer the research questions directly. For example, 'management communication' did not work as a theme, because it seemed to have an impact on teams regardless of their size. The impact of management communication, however, is discussed later in the thesis.

The fifth phase focused on the definition of themes; therefore, each theme required detailed analysis to ascertain how it fit the overall story (Braun & Clarke, 2006, 92). According to Braun and Clarke (2006), themes need clear definitions. Due to the explanatory approach, some of the main themes were already conducted in the interview. At this point of the analysis, it was possible to create a thematic map (Figure 1) showing how the themes relate to each other. The definition of teams also revealed which communication practices were affected by distance factors that were influenced by team size.

The sixth phase involved writing the report, which enabled a final opportunity for analysis. The analysis combined the data from the observations and interviews to achieve an understanding of internal communication in virtual teams.

5 FINDINGS

5.1 Observation

The observation data sheds light on group behaviour to highlight how team members communicate with each other and identify communication issues that both projects experience because of the team size. Hence, this chapter attempts to identify structures within teams, which is part of the triangulation of methods (Writing@CSU Guide). The results of the observation and interviews are compared with each other, providing a more in-depth and complete understanding of the studied projects (Writing@CSU Guide). As mentioned previously, deductive thematic analysis was used, and this had an impact on the data collection. The thesis is based on the assumption that temporal, geographical and socio-cultural distance factors truly exist. Therefore, these preconceived factors were expected to be found in the observation data.

Conducted codes were assigned to each distance factor, constituting themes that occur regularly in the data set. The study focused on the communication process and team size, and collected codes and themes were therefore analysed in those contexts. For example, issues with the success of a project that are disturbed by temporal distance were not taken into account. However, it is noteworthy that the communication process and project success are strongly related to each other. For the observed team, the communication process is part of the project success. Consequently, they cannot be fully separated from each other.

In the thesis, the observed data is separated into four factors: temporal, geographical, socio-cultural distance and communication technology. Each factor is observed from the context of the team size's impact and communication process. The observation did not focus on the content, but it was noted whether distance factors or team size were mentioned during the meeting. In addition, issues of communication technology that arose during meetings are mentioned in the description of the data.

Eight meetings were chosen for more detailed analysis in the thesis. Observation notes were used during the data collection, and they were analysed by using reflective journaling. The chosen meetings represent an average meeting, and they include patterns that were possible to find in other meetings.

To understand how team members actually communicate, all team members needed to take part in the observed meeting. This was necessary to maintain the reliability and validity of the thesis. The scrum framework approach guided the meetings to a large extent, which enabled a comparison of projects. The teams had a timeframe of one hour to achieve shared understanding in meetings.

Meetings occurred regularly, and each event had a specific purpose. Members of both teams held a regular daily meeting to share the status of the work. In addition,

every second week there was a retrospective meeting, planning meeting, grooming and review meeting.

5.1.1 Observation of Sprint meetings in Project 1 and Project 2

The purpose of planning is to evaluate and analyse the work for the next sprint, and a successful planning meeting should result in a shared understanding between all team members. The sprint goal is a strong indicator for defining needed items. Team members require in-depth knowledge of the current goal and details of each item in the product backlog. All meetings were held in English, which was the second language of each team member. Team members often referred to common problems, and rarely did a discussion about tasks refer to a single person, unless one person was specifically responsible for a specific task.

In general, for both teams the definition of an efficient meeting was when the team shared a common understanding. It was vital to the success of the project to understand the sprint goal and the objectives around it.

Geographical distance

Common issues for distributed teams are that information might disappear, and lack of awareness might increase. The observation data reveals that, regardless of the meeting, participation differed significantly between the analysed teams. In Project 1, only four to five people participated actively in the discussion. In line with Ortiz de Guinea et al´s (2012) finding that weak information sharing can lead to lack of task awareness. Reduced knowledge sharing emerged as an important theme in every meeting. This not only reduced in-depth discussion and feedback but also seemed to increase uncertainty as to whether the goal and needed objectives of the sprint were clear to everyone.

Hinds et al. (2003) underline that geographical distribution has a significant impact on task accomplishment and communication process. However, participation was significantly higher in Project 2, as indicated by the participation of six people. Regardless of the incomplete information that both teams experienced, the majority of team members in Project 2 participated actively in the discussion, whereas team members of Project 1 had difficulties maintaining an active discussion among all team members. It seems that participation regarding task-related topics was relatively low in Project 1 where 17 people took part in meetings. Larger teams might have more diverse expertise and skills, team members have fewer opportunities to participate in the conversation (Bradner et al., 2005, 2). Larger teams do not seem to benefit from the diverse knowledge because the number of tasks that were on the table was so high that it would have taken too long have in-depth discussion about every task. Therefore, shared understanding was difficult to achieve.

Notably, both teams were highly motivated to achieve a common understanding, as this was something they often discussed. In Project 1, the participation was higher in retrospective meetings, but in Project 2 the participation was evenly distributed. In both teams, planning and grooming were often mixed, which partly led to confusion.

In the grooming of Project 1 incomplete information and work distribution were the reasons for the lack of shared understanding as these factors can lead to a lack of task awareness. Even though Project 1 aimed at understanding aspects of each part of the project in every meeting, the team was too large to maintain this principle. As a result, effective communication and knowledge sharing were often challenging and sometimes impossible.

The main reason for lack of participation in grooming of Project 1 seemed to be the large size of the team, which resulted in a forced distribution of tasks. In this context, team members worked on separate parts of the project. As a result, discussing and analysing different stories and objectives all together was challenging if the knowledge was concentrated on specific parts of the project. It is traditional in a scrum team for everyone to engage in discussion and collaboration to attain the objective of the sprint. However, in the observed grooming meeting the first topic of discussion was that everyone should take part of grooming even though at one point it was decided that grooming was supposed to be held only with certain people in order to have effective knowledge sharing. The data demonstrates that the majority of the team in Project 1 required the participation of everyone in a meeting in order to share knowledge and feedback. This was noted as crucial for efficient communication and shared understanding. Reasoning behind this can be that in a meeting with specific people a needed remote colleague may not be accessible when their knowledge is required, which diminishes input giving and information sharing.

For Project 2, project distribution was not necessary, and the team members were able to share ideas. Lack of information had a smaller impact on participation in Project 2, which can be partly attributed to the pressure to talk when there are fewer people in a meeting. Participants were also more aware of the status of other team members. The reduced team size enabled – even forced – everyone to define and analyse items and discuss their necessity for the sprint goal. This seems to be in line with Bradner (2015), who found that smaller teams were more aware of their goal and familiar with team members' personalities. Indeed, active discussion seems to be easier in smaller teams where people know each other better and are required to discuss together.

Even further from the observation data emerge that team discussion did not seem to be an issue, but instead, Project 2 required better preparation for meetings from individuals. This was particularly notable in retrospective meetings where the team discussed improvements in order to develop their work. However, lack of background information complicated this. Consequently, this theme was regularly repeated in retrospective meetings. The impact of the size appeared even more in the

retrospective meeting of Project 1, where team members aimed to understand how communication had worked from the perspective of the whole team. The team actively tried to minimise communication difficulties, but this proved challenging. Hence, the main problem for Project 1 was judged to be the team size.

It can therefore be assumed that the focus of efficient communication is more on the individual level when the team is smaller, while larger teams are focused on the team communication process and how to maintain effective discussion, even though this can be difficult with a big team. It emerged from the data that the participants of Project 1 noted that communication improved during the project. However, regardless of the increased quality of communication, all team members thought that the team size interrupted their workflow and knowledge sharing, and they would have preferred to work in smaller teams. The issue of team size never arose in Project 2 during any meeting.

All in all, large team size seemed to diminish shared understanding because the task distribution complicated task-related discussion. Team members were not able give feedback or held an in-depth discussion because they were not fully aware of the current status of team members. Knowledge sharing was interrupted by difficulties in communication process when all team members took part in same meeting and the number of tasks was too large to discuss in a same meeting, which resulted as a splitting of the meeting. Even though small team experience also difficulties in communication, the thesis suggests that with smaller team size it is possible to increase the effectivity of communication process.

Sociocultural distance:

Observation revealed no significant connection between the language barrier and reduced communication effectiveness. Occasionally, team members from both teams were not able to immediately recall specific words in English. While this was judged to have no impact on the efficiency of communication, it did not appear either that language did not impact the quality of communication. The final part of the findings enables a more in-depth analysis of whether language creates misunderstandings and, most importantly, how it impacts communication.

From the observation data it is not possible to discern that issues caused by national or organisational cultural differences affected communication. Notably, in the retrospective meeting of Project 1participants explained that the communication between Belarussian and Argentinian participants improved consistently, even though the Belarussian teammates were occasionally dissatisfied with the meeting timetable. Both teams were satisfied with the social support they received from each other. These findings are in contrary with Morrison-Smith et al. (2020) and Damian et al (2012) who hold the view that national and organisational cultures challenge communication between team members.

However, one major difference between teams was apparent from the daily meetings, which is related to the themes familiriaty and interpersonal discussion. The number of participants who joined the interpersonal interaction was 6 to 7 in both teams. It appeared that they were less likely to share personal matters with their teammates. Often geographically distributed teams face a lack of familiarity, which can result in a diminished feeling of teamness (Ågerfalk et al., 2008, 2; Marlow et al., 2017, 580). However, Project 2 was more likely to feature interpersonal interaction before the meeting started. From the data emerge that the majority of participants engaged in casual conversation in the opening minutes of meetings. To be identified as casual, a discussion had to include more extended interaction between team members, but not all team members had to join the conversation. For example, team members often shared jokes and were actively asked by name how someone was doing. From the data it also emerges that people were more aware who was missing from the meeting, if someone was late. This is again in agreement with Bradner (2015), who found that in a smaller team people familiar with team members' personalities. Another explanation for this is that in small teams involve increased appropriateness, openness, richness and accuracy appear more often (Lowry et al., 2020, 657).

Communication technology:

The data reveals that discussion was interrupted mostly by difficulties with communication technology. As predicted, from the observation emerged one theme "unreliable communication technology" Project 1 experienced significantly more difficulties than Project 2 when using the communication technology. The discussion of Project 1 was interrupted due to difficulties with the videoconferencing tool approximately three times. From the observation data appear Project 2 experienced difficulties approximately 1.5 times during meetings. The number increased in daily meetings. The most significant impact of unreliable communication technology was when a team member aimed to share information but was not able to talk due to the poor internet connection. As a result, Project 2 was not able to continue in-depth discussion with the topic, which appeared as a disappointment by team members. Moreover, occasionally team members were accidentally removed from the meeting room, which reduced the possibility for shared understanding. Consequently, the quality of communication in Project 1 seem to be affected by the communication technology. Project 2 also had difficulties with the communication technology tool, but to a notably lesser degree. Another theme emerged from the data "enabling communication technology". In fact, a problem that emerged from the observation was that the videoconferencing tool was not capable of showing more than 11 participants simultaneously. Due to the high reliance on communication technology, it is possible to claim that limitations of the videoconferencing tool reduced the quality of the communication even further in Project 1, because the purpose of videoconferencing tool is to enable similar interaction than it would be in face-to-face interaction. Using tools like Skype and Lifesize

give a possibility to see non-verbal cues like face expressions. Lack of non-verbal and verbal cues can be harmful for human interaction and can result in false assumptions and false contradictions of what is being said (Daim et al., 2012, 203). Due to the smaller team size, participants in Project 2 could see all their fellow team members simultaneously.

Temporal distance:
The data illustrates that even though the delay did not directly impact communication in either team, the length of delay differed between teams. Theme delay appeard from the data regularly. On average, planning meetings were delayed by nine minutes in Project 1 and by four minutes in Project 2. This study accepted that one- to two-minute delays are expected and impossible to avoid. In several cases, delays were caused by delays in other meetings. Occasionally, meetings of Project 1 had an impact on delays in Project 2. Regardless of the length of a delay, it arguably had an impact on communication.

Reasoning behind this can be found from the literature and observation. As mentioned previously, the team aimed to keep meetings within an hour or an hour and a half, and therefore the meetings were characterised by limited time. As a result, delays increased the pressure to accomplish a highly complex discussion on time. Time-zone differences can create a lack of overlapping working hours (Ågerfalk et al., 2008, 2), which can also result in reduced interaction. Planning meetings were often held in the afternoon, Central European Standard time, or before other meetings, and therefore it was vital to keep meetings on schedule, which increase the pressure the finish the meeting on time. As a result, discussion might be less detailed, which consequently, decrease the in-depth of the discussion and shared understanding. Planning meetings in Project 1 were often delayed more than in Project 2, which is not surprising given the higher possibility of at least one person being late in larger teams. Hence, observation revealed that the probability of the meeting starting later than planned increased substantially when the team size was bigger.

Overall, these results indicate that Project 1 meetings were characterised by incomplete information, difficulties with communication technology and lack of active participation, as a result of the large team size. The meetings of Project 2 were mainly characterised by incomplete information and occasional difficulties with communication technology.

Observation data provides evidence that size matters in global virtual teams. The data indicates that a significantly higher number of issues created by distance factors are found in larger teams. Compared to members of the larger team, members of the smaller team experienced significantly fewer communication-related issues – particularly with regard to geographical distance, which was the most significant distance factor creating communication difficulties in the larger team. The main issues were lack of participation, lack of task awareness and lack of shared understanding, which

is deemed normal for distributed teams. The observation performed in this study indicates that this is not necessarily true in every team. For example, task awareness and shared understanding seemed to be relatively high in the smaller team.

Temporal distance did not have a significant impact, unlike geographical distance and communication technology, but the size had an impact on temporal distance too. The larger team was more likely to start the meeting late. However, this did not have a direct impact on communication efficiency itself; instead, it increased the pressure to finish the meeting on time. A limited timeframe also interrupted the communication process. Larger teams had to occasionally extend their meetings to the next day because the number of items that needed to be analysed was so large. This required additional flexibility from team members. Due to the temporal distance, the possibility of organising a meeting with everyone and engaging in the discussion simultaneously was reported to be challenging.

All in, all the efficiency of the communication process and difficulties caused by distance factors seem to be connected to each other, which supports the previous study by Marlow et al. (2017). Virtuality has a negative impact on the communication process. However, from the study's observation data emerge that the team size influenced the communication process and, more precisely, was negatively influenced by a larger team size.

The most significant difference between the communication processes of the smaller and larger teams was participation and knowledge sharing. Members of the smaller team were more likely to participate with each other in a discussion, especially in regard to task-related interaction. Closed-loop interaction is possible to maintain even in larger teams. However, this discussion often involves only part of the team, and as a result, the sender or speaker of the message cannot be sure that everyone fully understands it. Consequently, shared understanding and effective communication between all members are hard, if not impossible, to achieve

To summarise, the observation data showed the impact of team size on distance factors and the communication process. This provided evidence of how size has a greater impact on the communication process than traditional distance factors do. Notably, a successful project does not necessarily require effective communication, and accomplishing a project quickly is sometimes the priority for the team. This might have a negative impact on communication, which consequently affects the research result. Additionally, in this study there was no possibility of recording different meetings, which could have increased the risk of bias, and this was one significant drawback of the observation data. However, as mentioned previously, observation data is used in the thesis to support semi-structured interviews. The interviews were organised after the observation, which enabled questions arising from the observation data to be answered. More specifically, they explain how distance factors affect communication in their project and whether the communication process is genuinely affected

by them as the observation data predicted. Most importantly, the interviews provided answers to the question of whether team size has an impact on these two factors.

5.2 Interviews

Communication is a broad concept, and it includes different aspects. This thesis uses the elements of communication defined by Marlow et al. (2016) – frequency, quality and content of the communication. These elements are the most relevant for achieving the targeted outcome in the interaction between team members (Marlow et al., 2016). The semi-structured interviews aimed at providing a real-life explanation of how distance factors (temporal, geographical, socio-cultural, communication technology) influence communication in virtual teams and how the size of the team affects these factors. This section is split into subsections, each focusing on communication distance factors and aspects that are arguably caused by these factors in globally distributed teams. With the findings of this study, it is possible to determine how team size impacts these factors and define how these aspects within distance factors affect communication practices.

As mentioned in subsection 4.2.2, this study combined several codes into a single theme. In the Table 4 presented communication aspect of distance factors represent different themes Codes were combined into those themes, if the size of the team was noted to influence that theme. The codes were analysed and compared to create five main categories that summarise the study's findings. All the codes are explained more deeply in the following subsections to clarify their role in the analysis and to determine what broader category they form.

Table 4 Themes and codes

Distance factors	Themes	Code 1	Code 2	Code 3	Code 4
Geographical distance	**1. Communication process**	Increased number of meetings	Large number of tasks	Losing attention	
	2. Task-related interaction	In-depth understanding	Lack of knowledge	Further information	Not understanding
	3. Teamness	Closeness	Uncertainty		
Socio-cultural distance	**4. Familiarity**	Knowing the other person			
	5. Interpersonal communication	Sub-grouping	Trust		
Temporal distance	**6. Delays**	Catching up later	Quality of the meeting		
	7. Coordination	Additional information sharing	Organising communication	Matter of organisation	
Communication-technology	**8. Enabling communication technology**	Visual communication	Replacement of synchronous interaction		
	9. Unreliable communication	Bad internet connection	Difficulties with Lifesize	Wrong video meeting tool	

5.2.1 Geographical distance

This subsection concerns the impact of team size on the geographical distance factor. Hence, this subsection involves codes that focus on themes identified as being influenced by team size when the discussion was related to geographical distance. It was possible to identify the following aspects from the data: teamness, communication process and task-related discussion.

In response to Question 1 (see Appendix), most participants indicated that the geographical distance itself had the least significant impact on communication. From the data emerge that in fact, geographical distance did not create difficulties specifically, but some participants preferred direct face-to-face interaction more than

communication via virtual tools. The reason for participants' belief that this element had a minimal impact seemed to be that geographical distance was connected with the term 'physical distance'. A common view among interviewees was that the interaction was not affected by the physical separation itself. Exclusion in information sharing, reduced interpersonal interaction, reduced knowledge sharing and a lack of feelings of teamness were not linked with the geographical distance itself when participants were asked directly about the distance. From the discussion emerged that when the discussion went further into the matter of geographical distance, answers from the interviews indicated that these previously mentioned aspects linked to geographical distance did indeed affect communication.

Regardless of difficulties associated with geographical distance, the most striking result to emerge from the data was that the impact of the distance factor was relatively stronger in Project 1. As the interviewee from both teams explain:

> 'I think the difference between teams 1…when talking geographical distance, in Project 1 we have the guys from Belarus, and Project 2 we are just…people from Argentina and Germany, not, we don't have another extra country.' (Team member 4, Project 2)

> Interviewer: 'Yeah. Do you think there is a difference in how you communicate because there is no Belarus team? Or does it really affect [the outcome]?'

> 'No. I think that there is…I think that that doesn't make any difference. Language or geographical distances are not necessarily such big issues…well, they create some issues, but the size of the team increases them.' (Team member 4, Project 2)

Teamness

This theme constitutes one of the most significant findings in this thesis. The feeling of teamness seems to play a major role in effective communication. Ågerfalk (2008) showed that geographical distance and the associated lack of closeness among scattered team members can result in a diminished feeling of teamness and a lack of trust, which can itself result in a higher possibility of conflict and misunderstanding. The data from the study detailed in this thesis does not fully corroborate previous results. Project 1 reportetd, indeed, they did not have a strong feeling of teamness, as one interviewee illustrates:

> 'I think in this couple sprints where we have been 15 people, is very difficult for them working towards a goal because there is so many people, so you really can't keep up with what everyone is doing.' (Team member 6, Project 1)

But the interviews with participants of Project 2 revealed that everyone felt they were one team, working towards one goal and sharing knowledge. The geographical distance did not seem to have an impact on the teamness of the smaller team. What emerged from the data is the possibility to communicate with everyone is better when the team is small. As team members from Project 2 explained:

> I like more small teams because it is easier to see the whole team. You know. When you have a lot of team members you know.. You lost, you get lost in the communication and maybe people that take decision doesn't communicate with all the participants, so maybe some communication get lost in the middle. So small teams I think that is good for us. (Team member 2, Project 2)

> 'I would say that in general we work as a team.' (Team member 1, Project 2)

The interviews revealed that only one person from Project 1 saw the team as one big team working towards one goal. It is notable that geographical distance itself was not mentioned as the issue. Instead, having an over-large team diminished the feeling of teamness. Additionally, according to the data, team members of Project 1 were not always sure how many people were on the team, mostly because the number frequently changed.

> yeah a lot.. that is.. I.. I think we all agree on that c team we such a big team and the idea is to have no more than 8 people and I don't know how many we are…yeah sometimes I felt like it is difficult to coordinate.. well. I don't know.. in what all the teams is working on. (Team member 5, Project 1)

This refers to the note of Sivunen (2007) that this is common in virtual teams. However, it can decrease the feeling of teamness when people are not aware who their teammates are or what their position is in the team. It seems like team members from larger team had constantly changing and growing team, which made identifying of team members more difficult, which decreased building the feeling of teamness between team members.

Therefore, one possible reason for the feeling of teamness is 'closeness', which is also the first code that arose from the analysis when the impact of team size on geographical distance was analysed.

> Interviewer: 'Okay. Do you think it's good team or team feeling or good relationship with others, it's because of the size of the team, or where does it come from? Or right people in right team?'

> 'I think it is mostly because it is small team. Yeah. In a bigger team, I think you make group…You make small group that you trust more and then you communicate more, so I think this team is working good because it is small.' Team member 2, Project 1)

As mentioned, Project 1 did not share the feeling of teamness, because they seem to experience that they were not close with each other, but instead, they were part of a bigger group, which has several teams. This is closely related to another code. Under the theme of teamness is 'uncertainty', regarding what a teammate already knows and the reaction of the teammate to discussed topics. Increased and close communication seem to diminish uncertainty, but a large team size decreases the possibility of

maintaining open communication. This is closely related to the communication process, which is discussed next. As one interviewee illustrated:

> It feel like a team…In Argentina, we feel like we are collaborating with some team in Belarus…and we are very close I think. I don't say that we are just one team…we are just close, and it is totally different. I think we understand each other…but in the end of the day, things like the team…we are the team in Argentina and team in Belarus and another team in Germany.' (Team member 1, Project 1)

Herbsleb and Mockus (2003), found in their analysis similar results. In medium-sized teams the feeling of teamness was reduced significantly when team members were distributed. However, most of the team members were located in Argentina, which might refer to a situation where communication is inequal because on-site team members have the possibility to communicate both directly and virtually, but isolated team members have access only to virtual communication (Morisson-Smith et al., 2020, 15). However, in Project 2 majority of team members were located in Argentina too. Therefore, it is possible to claim that teamness seems to be closely related to the team size. The small group seemed more united as a team, which can increase team communication even further. Consequently, the impact of geographical distance seemed to decrease so much that lack of physical closeness did not have as much impact on teamness as Ågerfalk (2008) predicted.

Communication process:

According to Hind et al. (2005), geographical distance has an impact on spontaneous communication. However, in all cases the participants reported that this was not an issue in any of the projects. Interviewees tols that daily and weekly meetings enabled the regular possibility of having discussions with everyone in the team, and all team members were able to organise additional meetings if needed. The code 'increased number of meetings' under the team communication process is important, as some team members of Project 1 recognised that the number of tasks was high because the number of team members was simply too large. As a result, meetings were longer than planned and needed to be continued on different days.

> And then we have also lot of groomings. Last week or two weeks ago, we had grooming [laughs] almost every day because we had lot of tasks and had lot of [laughs] team members. So, I think it's not very good. It's okay.' (Team member 4, Project 1)

> Interviewer: 'Okay. Basically there is too much going on? Too many groomings and too many team members. And they are related to each other? Do you think if there would be less people, there would be less groomings too?'

> 'So, I think yes.' (Team member 4, Project 1)

Team members preferred to have one longer meeting because such meetings are easier to follow, but under the circumstances, that was not possible. As a result, participation in meetings was relatively low, which the observation data verifies.

> " that.. we need to improve the communication in those ones because I can see that there are lot of silence. sometimes people doesn't reply some questions or.. it seems like nobody cares on what's happening when in fact it is maybe some someone is thinking about answer to give.. So.. I think that plannings are groomings should be long meetings, but dynamic. We are, we are not dynamic at all." (Team member 1, Project 1)

The complexity of the current project required detailed information sharing, which was reported to not to ne possible in the larger team if there was only one shorter meeting. Splitting the meeting over different days might result in an interrupted communication process.
From the data does not emerge that team members of Project 2 would report experiencing interruption of the communication process because of long meetings. This is supported by the observations, which showed that Project 2 was more likely to finish the meeting on time without the need for additional meetings. Both teams shared one common problem, which was the failure to communicate the objectives of the client's requirements.

> Team members that are not located in our main office don't often receive the information what is going on, and there are many projects managed from the city and teams don't receive all the information from different projects." (Team member 7, Project 1)

As this factor was not impacted by team size, it is not analysed further in this thesis. However, it is important to note that it had an impact on team communication in both teams. This data suggests that the communication process, and consequently knowledge sharing, might have been interrupted by the team size. As Marlow et al. (2017) predicted in their study, frequency of communication increases in virtual teams, which results in an increase in irrelevant communication. Although larger teams have more diverse expertise and skills, team members have fewer opportunities to participate in the conversation (Bradner et al., 2005, 2). However, this thesis does not indicate that the content of the discussion would be irrelevant for the project. The codes 'large task amount' and 'losing attention' are also under the communication process theme. Some members of the team seemed to believe that part of the discussion was irrelevant for them, which made the discussion difficult to follow. As one interviewee stated,

> 'Yes, it affects because sometimes it makes…the meetings long, and when the meeting is too long you lost the attention of the of the team. I mean. Some, some people for the team will pay attention 100% of the time, but some other will be doing whatever…When it is a really long meeting, you lost the, the point.' (Team member 4, Project 2)

To avoid the communication process being interrupted by an increased number of tasks, splitting the session was necessary for the project's success. As one interviewee said:

> we set in we can only meet with 3 or 4 peoples in the grooming and other 3 or 4 in the planning, because to be a.. because we are really big team and for that reason if we have all those in a meetings.. probably we spend a lot of time. trying to get an agreement about how to do a task, or what write in the task (Team member 5, Project 1)

However, interviewees reported that in the long run, the team must understand aspects of the project that are outside its main focus. From the data emerge that, indeed, the majority of the team in Project 1 required everyone to participate in task-related discussions to maintain effective communication and knowledge sharing. This theme is discussed in the next subchapter.

Task-related discussion:

The interviews indicated that no one from the development team of Project 1 believed that they were able to reach a common understanding in their planning or grooming meetings, even though these two meetings are crucial for project development. One reason was the interruption of the communication process due to the amount of work that needed to be covered in one meeting. Most of the time, meetings were told to be too long, a situation that made the conversation hard to follow. According to the data, as a result the participants of Project 1 eventually organised knowledge-concentrated meetings such as groomings with fewer people. Three codes under the theme of synchronous task-related discussion were 'in-depth understanding', 'multiple meetings' and 'lack of knowledge'. Lowry et al. (2020) found that increased group size decreased the quality of discussion significantly compared to a smaller team, and even though larger groups gain in experience and knowledge, a complex project may actually benefit more from smaller teams. It seems that this was the case with Project 1.

Members of the larger team explained that after splitting into sub-groups they were able to have shorter and more in-depth discussions, but splitting the team created another issue that affected the quality of communication, specifically in the area of shared understanding. As one interviewee illustrates:

> I know it's expensive talking about the size of the team and do have 15 people and just three of people participate during the meeting but I do think it's, if we are going to work as team, it is necessary to do have all team present so they know what everyone is doing. I mean that the idea of having the team, but the size is not ideal (Team member 6, Project 1)

Interviewees mentioned they did not have enough in-depth understanding of what the other team members had created and how their actions and decisions could

have affected the project outcome, which was reported to be visible especially in moments when the team was supposed to report its status to the management because of the possible demo. This issue is captured by the code 'in-depth understanding'. It was necessary for the success of the project to divide the team, but the task-oriented communication decreased when the project team was divided.

> 'It's a small cell or small team focus on deliver...which is working on, for example, in this case this project. I have no idea about how it implement today this one tool, for example. And it is not also easy to read in in all the implementations and so on, and this is more or less my point of view.' (Team member 3, Project 1).

> 'Yeah. We get bigger and bigger with the time because given that we have to give another solution, we have been adding more and more people...yeah, I think it could be a problem...when you do what we are doing right now, we...that is splitting on the meetings, for example...doing a meeting for a sub-group of people that team…so if you are not making sure every word everyone will have that information, that could be problem because you will be talking about some things that mean that rest of the people won't know, so that could be a potential problem at least...' (Team member 1, Project 1)

> "split the team just invite people who are necessary and knows about the topic. But ähm.. I dotn know. I. In the last retro the guys said that they erally want to be in whole grooming, because it provides good feedback to them to have a straight face to face interaction with the Product owner or whoever is doing the that role" (Team member 6, Project 1)

Furthermore, from the interview data was possible to notice that Project 2 participants did not always create a shared understanding, mostly due to two reasons. First, team members thought that they understood the task correctly; later, however, the misunderstanding was noticed and also fixed because team members contacted everyone from the team in a common channel and discussed the topic that was misunderstood. As one team member states:

> "well. Yeah that has happened yes. It has happened to me actually. Maybe sometimes we.. I can speak for myself. Sometimes I think I understand, and I can form idea in my head or the general aspect of specific thing. Yeah. after the meeting I go and review the information in the confluence or the Jira. And then I realise okay I didn't see that in this way or I didn't see that coming. Well I need to start a new flow of the information, you know. So that happens yeah." (Team member 1, Project 1)

Second, as mentioned before, the management did not inform the team of the objectives and goals of the project, and consequently, the team was not able to have further in-depth conversations. This was mentioned by both teams:

> Interviewer: 'Then about planning…How…are they effective and working well?'

> 'Yes. Yes…the planning is only for some things in task that we start working. I think that is...We have issue in the grooming because sometimes we don't finish the definition of all the task in 100...so in the planning we need story point to the task but sometimes we are not doing good job there…From my point of view is the lack of the communication of the

objectives of the requirements of the client or the company wants from the solution.' (Team member 2, Project 2)

"This is a thing ... Honestly no one told me, which is the objective. I don't have clear understanding what is the objective" (Team member 6, Project 1)

Because Project 1 had similar issues to Project 2, task-related interaction may be influenced by team size. A smaller team size seems to increase a team's internal knowledge sharing and in-depth understanding. This thesis does not claim that the knowledge sharing of the management has no impact on communication, but reduced team size might increase the discussion activity between team members.

It is also notable that task-related interaction seemed to be affected by team size after the meeting when the task-relation interaction was asynchronous. Team size did not necessarily decrease information sharing per se. However, discussions were held differently in the two projects. The fourth code that emerged from the data was 'further information'. Team members from Project 1 said that they were more likely to ask team members privately if task-related information was unclear as one answer illustrate:

Interviewer: 'Okay. So you would prefer asking after the meeting if something is unclear rather than in the meeting itself?'

'So, I think it depends. So, sometimes I can ask right on the meeting, but sometimes I need to…I don't know. I need to...understand maybe…to figure out what they guy said and what. What he wanted to…say to us so what he wanted to do. So I need to understand it. But if have questions that I…ask them directly by Slack.' /Team member 3, Project 1)

Interviewer: 'Okay. Do you ask something in the meeting or asking privately after the meeting?'

'Depends…If I have the feeling the other person didn't understand me, I ask the person did you really understand what I…I was asking for.' (Team member 7, Project 1)

Interviewer: 'Okay. Do you. Do you think that it is comfortable for them to say I didn't understand and repeat what was said because they didn't understand, or is it something that they avoid…in your own opinion?'

'The team itself asks questions, but not all members of the team are the same. So some of them....are shy to ask...or scared they seem stupid if they ask too often...but I think in general...we have someone in the lead like technical leader needs to clarify this.' (Team member 7, Project 1)

As this statement of one interviewee shows, Project 2 seemed to ask further question if something was unclear and did not feel ashamed to ask, even though he claimed that he made a mistake earlier in the meeting:

"well. Yeah that has happened yes. It has happened to me actually. Maybe sometimes we.. I can speak for myself. Sometimes I think I understand, and I can form idea in my head or

> the general aspect of specific thing. Yeah. after the meeting I go and review the information in the confluence or the Jira. And then I realise okay I didn't see that in this way or I didn't see that coming. Well I need to start a new flow of the information, you know. So that happens yeah." (Team member 1, Project 1: cited earlier in Page 52)

Being too shy or scared to ask questions in front of everyone is important factor. Asking privately for clarification is understandable, as one interviewee stated that some team members were too shy or scared to ask publicly. This is closely related to the feeling of teamness. The fear of writing something wrong in the common chat channel increased the use of the videoconferencing tool, which could result in a lower likelihood of receiving feedback from people not in the meeting.

In addition, spontaneous meetings are more likely to be held with specific people, especially with people with a shared language. However, the interviews showed that language created some communication issues in projects. Participants did not identify it as a problem in this context, but rather as a minor difficulty related to the complexity of the technical vocabulary, resulting in the need for extra effort when communicating. The language barrier did not create a loss of information, but the complexity of the vocabulary required more effort in communication:

> Interviewer: okay. So.. do you think the information disappear because of not understanding or language barrier? Like you said they asked in the private channel what did just happen, but could it be possible that this information just stops existing because mm.. people didn't understand."

> "I try to think a real-life example and not just the assumption… could that… I don't remember if some something was developed wrong way by not because they didn't understand what we meant." (Team member 7, Project 1)

> "yea yes. I would say in general terms we don't have major problems with the language. I would say the major problems could be related to how to understand the complexity of the technical stuff." Team member 1, Project 2)

Hence, from the data did not emerge that the language would have decrease task-related communication, which could have affected on results. – instead, the thesis suggest that the large team size decreased the feeling of teamness, which resulted in a fear of communicating in the common channel, decreasing task-related communication in the whole team. It is possible that this tendency increases unfamiliarity and subgrouping even further, which might already be a problem for larger teams.
This study suggests that reduced team size makes it easier to share information and achieve shared understanding because the fear of saying something perceived as 'stupid' and being judged is relatively lower in a smaller team.

These findings suggest that physical distance itself does not cause communication problems, but the large size of a team decreases the feeling of teamness, knowledge sharing and personal information sharing, which can be experienced in geographically distributed environments.

5.2.2 Temporal distance

This section is related to temporal distance factors. The following themes were generated from the data: coordination and delay. These aspects were influenced by team size when the discussion was related to temporal distance. Arguably, these aspects have an impact on teams' communication practices.

Coordination

According to the data, although the time difference was six hours, most team members underlined that they were able to communicate enough with each other during the day. Most of the interviewees identified the time-zone difference as a small communication issue. It is vital to note that team members were often working longer hours, which can impact their communication and their satisfaction with the timespan in which they communicate. There was some variation in the team members' answers, but not between projects. Meanwhile, the management identified the time-zone difference as a problem, the development team did not indicate the time-zone difference would be an issue:

> No. I know that.. that is happening.. for example, if I see that is a problem.. and.. I have to catch up maybe with because I need to be lined up with the rest of the team, but it is a normal thing.. some things are happening on the project then.. you catch up some minutes then.. you keep up with the day." (Team member 2, Project 1)

> 'I think for some convos they are not always included. I'm not 100% right now, but it happened [in the] beginning. And in the last retros, some of the guys said that yes, they have meetings too late for them. So... this is ideal for one team that has a smaller time zone difference but not for someone that has a six-hour difference' (Team member 6, Project 1).

Findings indicate that time-zone difference advanced the communication when the communication was coordinated well enough. Two codes under this theme are 'additional information sharing' and 'Matter of organisation". These codes describe the necessity for more coordinated communication in Project 1. According to the data, the team members of Project 2 coordinated communication between themselves because people recognised that this would be necessary for effective communication.

> 'I mean we know that when the information during our morning here in Argentina so we ask question a day before or on the same day as a first thing in the morning. So I assume we coordinate correctly the communication from this point of view." (Team member 2, Project 1)

> "I think both. I think that the this.. Difference between hours and time is a good for me because I know that I have all the meetings in the morning and I know that after the lunch

time I can working without working any other person from the team so for me is great is this difference in time." (Team member 2, Project 2)

As previous comments show, coordination seemed to be easier in Project 2. The interviewees from Project 2 seemed to share the opinion that temporally dispersed team are required to maintain good coordination to achieve effective communication. However, Project 1 seemed to more difficulties with time-zone differences. An interviewee explains that, at the beginning of the project, the team members had significant difficulties in maintaining effective communication when one part of the team was not available. As a result, Project 1 had to create an additional communication system in which the Argentinian team members reported their daily achievements via an instant messaging chat room. Team members from Belarus and Germany used this information to continue working the next day. This system seemed to facilitate much more effective communication. Therefore, the third code is "organising communication'.

'The beginning…was complicated…because of the time-zones, [and] thanks to management…we got better organisation within teams… For that reason, we started [to] write down in the common channel of our team what we did on our day daily…and for that reason guys from Germany and Belarus, when they start their day they know what we did on afternoon on a day before…and for that reason…they know a bit better the current status of work…of the environment'.

'Very good, because before they went to bed in Argentina, they posted what was done today…[and] then on the next day whenever they got up, we started with the daily, and the Belarus team informed what was done in their part this day' (Team member 7, Project 1).

'Sometimes, I need to wait for someone answer, if I need to wait so then I just start working on something different. Not to do something, because I can't sit and don't do anything' (Team member 4, Project 1).

Therefore, it is possible to claim that coordination is not only advantageous but is also compulsory for globally distributed teams. The necessity for additional coordination seems to be important, especially for larger teams. Globally distributed teams have reduced shared working hours, which results in an even greater dependency on coordination. Van der Kleij (2007) underlines that different locations and time zones can complicate coordination, but larger team size seems to increase the need even further. Interviewees state that temporal distance is part of working in a globally distributed team and that the organisation needs to give team members the right tools to adapt to the situation. One interviewee predicted that communication in global virtual teams is a constant learning experience and that to become a good communicator requires much time, coordination and training.

Delays:

The data provides mixed results about delays and how they affect communication. Two codes regarding the impact of delays emerged from the data: 'catching up later' and 'quality of the meeting'. When asked whether delays were a problem, a minority of the respondents reported that delays could create communication difficulties:

> 'No, no. I think no one is late…probably, the manager is very busy because he has lot of meeting[s]...but [the] developer team, no' (Team member 2, Project 1).

> 'In general terms, being a few minutes late (laughs). I'm sometimes (laughs): No. I think that… Well, it depends on the team. Depends on the people at the end of the day... Being few minutes late doesn't make any difference' (Team member 1, Project 2).

Some team members stated that delays could be a problem, but not necessarily on their team. One interviewee stated the following:

> 'No, I know that…that is happening… For example, if I see that is a problem…and…I have to catch up maybe with because I need to be lined up with the rest of the team, but it is a normal thing… some things are happening on the project then…you catch up some minutes then…you keep up with the day' (Team member , Project 2).

> 'in daily.. I think the only problem is that we have to wait few minutes someone else or myself because I'm lot of times been late on dailies… but we have this document listing all the things that we are.. working on during today, so in case you are late, and you can totally know what updates reading that document so we don't wait for anyone.. probably I can see maybe that some in grooming or any.., discussion we have in a meeting.. ähm.. maybe we, we need to ask something someone particular and meaning that that… the person is not there but we.. .. go to the slack channel and being like reaching him out' (Team member 1, Project 1).

Even when someone was late for a meeting, communication technology enabled them to prevent any communication issues that might be caused by delays. The company used Jira as a support for communication coordination and as a visual component. Team members could check the status or topic of the meeting in case they were late. For the interviewees, meeting delays were considered matters of respect (or a lack thereof), but the delays did not seem to directly affect the communication between team members but had a more significant effect on the work itself. However, it is still possible to claim that delays have an impact on communication, which increases when the team is large.

Few employees explained they could ask for the necessary information later. However, these delays might have a negative impact on team communication because they decrease, for example, feedback-giving and knowledge sharing with the whole team. From the data emerge that a couple of interviewees recognised that delays cause rushing in the meeting and, consequently, diminish the quality of communication:

> I think that is a problem. I think that in overall is a problem to be late or miss some meetings because maybe some other team members forget to tell I'm not there and I miss the meeting,

> and they need to know. But I think that it is not happening in this team (Team member 2, Project 2).

Morisson-Smith et al. (2020) argue that having fewer overlapping hours increases communication breakdowns, which can lead to false assumptions and incorrectness. Therefore, it possible that delays, which lacks overlapping communication, also increase communication breakdowns. The reasoning for the idea that large team size decreases delays is based on the observation data, which gave an overview that Project 1 was more likely to start the meeting late because some of the employees were delayed, and as a result the team had rush to be able to finish the meeting on time. As one interviewee from Project 1 illustrated:

> Yes, because people have scheduled meetings afterwards, and it delays the whole day, and it really affect[s] the meeting quality because you have to rush through some topics…you would usually spend more time on' (Team member 7, Project 1).

The majority of the responses indicate temporal distance as part of working in a globally distributed team. In this sense, it is essential to acknowledge that temporal distance can be identified as a problem if the team is not well coordinated. However, team size can impact temporal distance and its associated challenges. Challenges that are caused by time-zone differences, delays and coordination of communication could be possible to be able to be diminished with smaller team sizes.

5.2.3 Sociocultural distance

This sub-chapter presents themes that focus on socio-cultural distance factors. The following themes were identified as influenced by team size when the discussion was related to sociocultural distance. The themes generated from the data are "familiarity" and "language". These themes support each other, and they are partly connected, as the following analysis shows.

Familiarity

One code regarding the theme of familiarity was generated from the data: 'knowing other person`. Some fear of how another person might perceive a message, was found in the responses of the interviewees. The interviews with participants showed that at the beginning of the project, both teams experienced difficulties and fear regarding communicating with team members. One interviewee reported that, after the management visited the team in Argentina, this problem seemed to disappear in the Project 2 team, and relational interaction became easier than it was before:

> 'I think that the.. The visit that we had in February. Managers visited Argentina and that has helped a lot because previous to that. The relation. Yeah the.. The interaction we had with the manager, for example is not the same than the interaction that we have today, because

> we have spent some time with him. We share some meals and some beers (laughs). That helps a lot so I would say that we have improved thanks to that' (Team member 1, Project 2).

However, this was not the case in Project 1, in which one interviewee indicated that the problem of not knowing the teammate was still an issue in the team after asking would it help to meet with the team:

> "yeah, bonding like sharing a beer, meal I don't know.. something like that helps a lot to know to know the other person and gain more trust. And you know you can say anything and you can even… mention some issues.. in the in the team or communication and different aspect. It will be taken like good for the other person" (Team member 1, Project 1)

This thesis suggests that, when the team size is large, the possibility to get know to the teammate decrease. The team members of Project 2 seemed more familiar with each other and seemed to benefit more from the management visit more than Project 2. As one interviewee from both teams stated:

> Yeah definitely. Yeah. I think that is really good thing.. Because it improves the communication and feelings about other team what is on the other side. Maybe there is little bit difficult the language but I think that we do it pretty good you know. We make jokes all the time and we speak from different things and I think that is a good relationship that we have with the rest of the team." (Team member 2, Project 2).

It remained unclear why Project 1 did not experience that their familiarity between team members did not increase after the visit. A reason can be that part of the project (Belarussians) did not join the on-site meeting. However, it is possible to assume that smaller teams would benefit more from the on-site team meeting than a large team because often team meetings have a limited time span, and team forming might take longer than predicted. It is possible to expect that regardless of the team size, team communication benefits from face-to-face interaction.

Interpersonal interaction

Both teams identified that personal information sharing between team members was effective. However, the interpersonal interaction seemed different depending on the team. The code that arose from the data regarding the analysis of sociocultural distance was 'sub-grouping'. Team membes of Project 1 reported more that they had issues with in-group and out-group categorisation. This has the possibility to lead to a lack of interpersonal interaction as one interviewee comment shows:

> Interviewer: 'Yeah. Okay. How about then.. if you talk about personal things like how life has been. Do you share it likely with the other team members? Or is it something that there is no need for it. Or you don't have the time or?'

> 'So I think yeah. It happens. So if I.. find something.. that they need to.. tell about to the guys that I... tell about that to our, our Belarus team (laughs). And then if it very necessary or important, then I can send the message to our slack channel. A personal to someone, some guys that maybe are working on a task that may be affected by what I help' (Team member 4, Project 1).

Bataresh (2016) implies that geographical distance could cause this lack of interpersonal interaction, but the observation and interview data is partly contrary to Bataresh' suggestion that virtual teams share less interpersonal communication. Indeed, the data suggest that the Project 1 team members were more likely to share personal information with team members from their own country. When the personal information would have an impact on the team member's accessibility or on the project itself, the team members would share the information with all team members. However, this did not seem to be the case in another team. The Project 2 team members explained that they shared jokes and personal information regardless of nationality. They shared personal information both in Slack and in meetings. This result may again be explained by the fact that interaction in smaller groups is more natural relative to larger groups.

> Interviewer: 'Okay. Then about virtual teams. You are small team. How is this communication about not work-related things? Do you share personal things?'
>
> 'Yeah definitely. Yeah. I think that is a really good thing.. Because it improves the communication and feelings about other teams what is on the other side... We make jokes all the time and we speak from different things and I think that is a good relationship that we have with the rest of the team' (Team member 2, Project 2 cited at Page 59).

Both teams reported that they maintained an informal discussion, and as mentioned, they identified that they shared enough personal information. However, from the data emerge that the probability of team members' sharing personal matters decreased when the team was large:

> Interviewer: 'Okay, good. From your own opinion, how can better communication be reached? You already talked about it already. You mentioning let's say… from.. you as a person as communicator, what would you do better? What would you improve in yourself and your communication?'
>
> ' `I think the base here is trust between the team members… and I will reach about improvement and they ask why. The thing is that if I…I'm afraid what can I say if I say something and I can offense someone, I will rather not to talk than talk' (Team member 1, Project 1)

This is described by the code 'trust', which indicates that smaller teams have stronger trust between team members, which increases interpersonal discussion. As a result of this trust, team members became more familiar with each other.

Interpersonal interaction is one important aspect of the communication process. As mentioned in the literature review, the communication process always has content, and relationship-oriented content includes interpersonal matters like an informal conversation. Though there was not necessarily a wish for informal discussion in the meetings, the participants of the larger team seemed to have more doubts about how teammates would perceive, for example, jokes. The team members of small teams more often reported that they were comfortable sharing personal matters with their teammates than did the employees in larger teams. The distance can be diminished by a higher trust and believe that others will share the knowledge between team members (Bhat, 37). This seemed to be the case with Project 2.

It is worth mentioning that no one from either team recognised different organisational culture or nationality as a problem. Instead, the presence of different organisational cultures added value to communication. The Argentinian team members had their own organisational culture created by the primary organisation of their employment. This organisation's communicational values were also partly implemented to the main organisation.

> Interviewer: 'Good. Then we can go to question number eight.. which communication rules the team has done in order to be more effective. Do you have some kind of own rules that you already set on a day one or some where. Has anyone made such rules for the collaboration?'
>
> 'In fact we have a.. you start in our company (in Argentina).. they share a document they have rules. I can't remember all of them, but more important the camera on always trying to be polite no matter the things that you are discussing. And trying to be clear…' (Team member 1, Project 1).

This increased the quality of communication because these values were based on respecting other team members and on decreasing disturbing factors like background noise.

Interviews provided mixed results about the impact of the size of the team on sociocultural distance. On one side, sociocultural distance largely affected familiarity and interpersonal interaction, but it did not seem to have an impact on other aspects like diversity, language and culture. These findings are in contrary with several previous studies and it should be further researched. However, the smaller teams seemed more comfortable sharing information regardless of the mode of communication, and they were more likely to share information with the whole team.

5.2.4 Communication- technology

Communication technology had one of the most significant impacts on communication in both teams. Yet, the results were mixed. In fact, communication technology was suggested to be somewhat more useful than an obligatory bad. From the data

emerge that difficulties increased when the team size was larger. Most of the team members explained that working with virtual tools positively affected communication, but further discussion showed that a few technology-related problems emerged. This sub-chapter identifies themes that focus on the impact of team size on communication technology. The following communication aspects were identified as influenced by team size when the discussion was related to communication technology: unreliable communication technology and information diffusion.

Unreliable communication technology:
Mixed answers regarding this theme appeared during the interview. Both projects depended on videoconference tools like Lifesize and Google Hangouts. Both projects faced connection issues, and constantly crashing videoconference tools created barriers to team communication: Majority of the participants commented that the regular dysfunction of videoconference tools created communication problems. For this reason, the first code is 'wrong video meeting tool'.

> Interviewer: '...and.. so… so you Lifesize mostly right now'.
>
> 'Yes. It is barely working and every team face difficulties using Lifesize. And on the other hand, we don't have Teams accounts for all the team so this is not an appropriate communication way either.. which is not approved by IT' (Team member 7, Project 1)

Two other codes were based on this observation: 'bad internet connection' and 'difficulties with Lifesize'. However, from the data emerge that only Project 1 reported that they had significant issues with videoconferencing tools, which would have affected on knowledge sharing. Everyone seemed acknowledge that some issues appeared with communication tools, but team members of Project 1 mostly illustrated that it had a direct impact on their communication.

> "if I need to listen the guy who has issues with the internet connection then.. it can be a big problem I think. So because that guy has some important information for us. And if he.. if the guys has… connection issues then that's… That may have affected the work, yeah. (Team member 4, Project 1)
>
> "I mean in slack we face some crashes, and lifesize has some crash." (Team member 3, Project 1)

From the interview of Project 2 did not emerge any comments that it would have had an impact on their communication as one interviewee illustrated:

> "I think that we have all I need and I don't sometimes… sometimes we have issues with internet connection. Lifesize is not good application, but I think that always we.. we have different ways to communicate so I think that at least for me never happened to need to

> attend meeting and doesn't have a way to be in the meeting. So always I have. I think I have all that I need to communicate with other in the team" (Project member 2, Project 2)

Regardless of occasionally problem with Lifesize, Project 2 reported to be able to organise a meeting and share knowledge. The observation data supports interview statements. Indeed, both teams seem to experience a relatively large amount of problems with videoconference tools and Internet connection, which interrupted knowledge sharing and diminished the possibility for participating in conversation. However, this possibility increased with larger team sizes.

Enabling communication technology:
Generally, the interview participants found face-to-face communication in a co-located place more pleasant than virtual teams. However, the communication technology itself did not create significant issues in communication. The positive connection between task-related interaction and virtuality is worth mentioning because some of the participants explained that they found it easier to ask questions or for additional information in Slack if it was difficult to identify the right colleague for the question. Moreover, different work-related matters even required written forms.

> well. It depends.. there are for example, there is one very good example because… if its if I have problem, and I may know.. who I need to ask for help.. maybe to me its better in person, but if I have a problem and I don't know whom I'm supposed to ask, is very virtuality because I will put just on the on the slack channel like this issue who can help me or who solve it. And that's easier than going one by one in person (Team member 4, Project 2)

Therefore, it is possible to suggest that the quality of communication effectivity might increase when communication technology is used. The positive impact of communication technology seemed to be higher in Project 2, in which the number of team members was small. Every interviewee in Project 2 reported that, in addition to video meetings, they also asked questions of the whole team in Slack, which then enabled more detailed conversations when necessary. This was reported to increase knowledge sharing and the reception of feedback from all team members. For this reason, the first code is 'additional communication tool'.

> Interviewer: 'And then. What do you prefer in communication: written or spoken form? If you would have best possible tools in both ways. Write or speak?'
>
> 'It depends on the case. If I need some help with the code, it's always screen sharing sessions and its more helpful. If I need to define specific requirement, and it need to be in written, I prefer doing it in writing in slack. For example, in some planning sessions or groomings sessions we are all together having confluence call and then we can reach agreement and immediately we need to put it in Jira the description' (Team Member 1, Project 2).

As Sub-chapter 5.2.3 clarifies, this did not occur in Project 1, in which team members were more likely to share information in video meetings, partly due to language

and familiarity. Although Project 1 participants reported that team members used, the lack of familiarity between teammates can be claimed to diminish the potential of chatting tools like Slack, which are meant to facilitate further discussion between the whole team the next day or even after a week. It is vital to note that other factors, like task complexity and requirements, might impact which communication tool should be used. However, those factors did not seem to impact the probability that members of the smaller team would only contact specific people if a question arose.

The code 'visual communication' is under this theme because, according to data, additional tools like Jira and Confluence could also have a significant positive impact on communication in both teams. The importance of Jira and Confluence increased in Project 1 because, as the observation data shows, the possibility that someone was late or missing from the meeting increased when the team size was large. When they were asked what the impact on communication would be if someone were to be late, most of the participants reported that they could find information on the status of the meeting from Jira and Confluence if someone were late. The team members stated that there was no need to interrupt discussion or wait for participants to arrive if they were late, which, according to data, was reported to maintain shared knowledge. It raises the question as to whether the meeting is even necessary if all its information can be found on the Jira board. Therefore, the third code is 'replacement of synchronous interaction'. From the data emerge that on Jira, necessary information of the current work status could be found. However, using only the information board can diminish further discussion and feedback as interviewees reported when the discussion was about delays. From the data appears that this was, indeed, the case with Project as one interviewee explained:

> "for my side I think we don't have problem with the communication in English, but information like adding documentation in… in on Jira. We need to add more documentation in Jira for clarification and specifications about something and it is part of the… the way we work." (Team member 1, Project 1)

> Interviewer: "so do you think it creates some misunderstandings because of the lack of information in Jira. It need to be more information there?"

> "Yes. Yes because we have a… for example we have a general specification in the user story, but we need to write down the… the acceptance criteria for finishing the task in the user story." (Team member 1, Project 1)

Communication technologies create several advantages, like the possibility to work in parallel and therefore expedite completion of the project faster. Virtual teams have the possibility to organise their knowledge electronically and access different communication tools (Suchan et al., 2001, 176). However, team need to have the possibility to benefit fully from these tools. As mentioned earlier, Project 1 seemed to be too large to maintain effective knowledge sharing and it resulted as a lack of participation and

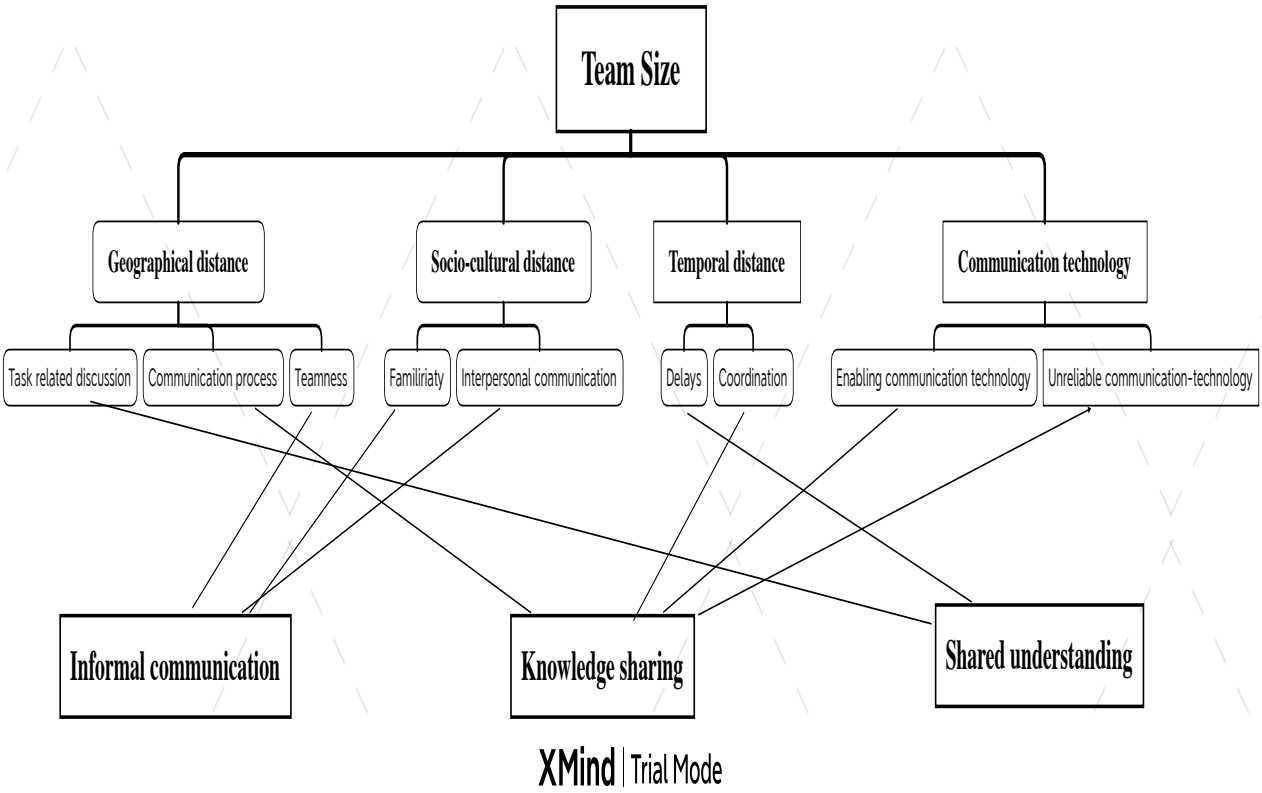
task-awareness. The comment of Team member 1 shows, that the team had more difficulties to benefit from tools like Jira and Confluence. Effective communication requires active participation. At this point, the impact of the team size becomes important. Several studies and interviewees have demanded some certainty of active participation for the sharing of knowledge, which, as predicted earlier, seems affected by team size. This demanding towards more active knowledge sharing in Jira and Confluence was only reported by a team member in Project 1. Project 2 reported the same issue, but the inactive reporting was explained to happen because they had limited information about client requirements.

The thesis suggest that companies should consider why they use additional tools for communication and which communication practices would be required to achieve the full potential of communication technology. Delays diminish knowledge sharing if the purpose of sharing knowledge is not fulfilled after the meeting, for example, in an additional communication tool.

In summary, this thesis aims at indicating how aspects of temporal, geographical, and sociocultural distance and communication technology influences communication practises, and how team size has an impact on those communication practices. With the gathered data, it was possible to generate eight themes within distance factors and which were affected by team size in researched teams. The findings and Figure 1 show that these themes directly impact communication practices. As mentioned, the codes were analysed and compared to identify three communication practices that are influenced by team size. By answering both research questions, the impact of team size on communication in virtual teams was determined. Using these categories, it is possible to provide an understanding of how the size of a team influences communication distance factors in globally distributed teams. More precisely, these categories provide an understanding of which aspects of the distance factors were influenced by the team size.

In the chapters that follow, this thesis presents the communication practices that were influenced by aspects of distance factors. As Figure 2 presents, these aspects are not separate from each but rather are connected, and they do not appear only in communication. Sub-chapters also provide criticism of the traditional view of what decreases the efficiency of communication in virtual teams.

Figure 2 Thematic Map



6 DISCUSSION

In the following section, the empirical findings concerning the research questions and theoretical standpoints presented in the first part of the study are discussed. This thesis aims to answer the two following research questions:

- How does the size of a team influence the communication distance factors in globally distributed teams?
- How is group size reflected in teams' communication practices?

This section discusses three communication practices, which are knowledge sharing, informal communication and shared understanding.

6.1 Knowledge sharing between team members

Knowledge sharing is not only vital for an organisation's operation but is also crucial to effective team communication. It enables the achievement of project objectives, a decrease in information loss and, most importantly, an increase personal expertise. Therefore, it is reasonable to assume that teams desire to maintain knowledge sharing. However, as the findings of this thesis show, effective knowledge sharing is sometimes challenged by temporal, geographical, sociocultural and communication technology factors. The following sub-chapter introduces aspects of temporal, geographical, sociocultural and communication technology distance factors that impact teams' communication practices. These aspects have one thing in common: that with smaller team sizes, the impact of these challenges can be decreased.

The analysis highlights five aspects within distance factors influenced by team size that impact knowledge sharing of virtual teams. These aspects are presented by interviewees and supported by observation. The main aspects are as follows:

- Unreliable communication technology
- Enabling communication technology
- Familiarity
- Coordination
- Communication process

As Marlow et al. (2017) have predicted, to achieve effective communication, team members are required to maintain closed-loop communication. Knowledge sharing uses the same principle as closed-loop communication: the sender sends a message,

and the receiver receives it, acknowledges the message and provides feedback. As a result of this knowledge sharing, team members create shared understanding. Interviews have shown that all team members seem to agree that knowledge sharing is a vital part of team success and effective communication. Sometimes, this process can be interrupted by different distance factors, especially in virtual teams, as several studies have predicted. This thesis suggests that reduced team size could be one possible solution for maintaining sufficient knowledge. Several challenges, caused by different distance factors, could diminish with smaller team sizes.

The larger team found it significantly more challenging to actively participate in a meeting and to share knowledge between team members. The data revealed four sizes related to overlapping reasons. Firstly, a lack of familiarity with fellow team members decreases team members' willingness to communicate openly. Secondly, the distribution of project tasks might decrease team members' active participation and knowledge sharing in the discussion. Lastly, communication-technology is limited in large teams.

The first reason for a lack of participation is sociocultural distance and, more precisely, familiarity. Van der Kleij (2007) and Holmström et al. (2006) claim that non-native language use can result in misunderstandings, lack of in-depth conversation and lack of knowledge sharing. However, contrary to their studies, the majority of interviewees commented that the language barrier did not have such an impact that it would have resulted in misunderstandings or a lack of knowledge sharing. Instead, they understood the linguistic barrier as an obstacle which did not have a direct impact on communication. However, when the interviewees were questioned as to whether they asked the whole team if something was unclear or if they did not understand something, the majority in the larger team commented that, about technical or complex matters, they would rather discuss in a private conversation after the meeting, especially with a person who speaks the same language. As the findings state, this preference is related to interpersonal familiarity rather than the language itself.

In smaller teams, people were more aware of the capabilities and knowledge of their team members, and they were also more familiar with their teammates. Lowry et al. (2020) have found that increased group size decreases the quality of discussion significantly compared to that of a smaller team and that even though larger groups have the advantage in experience and knowledge, a project may benefit more from smaller teams. For, small teams involve increased openness, richness and accuracy (Lowry et al., 2020, 657). This claim challenges the claim of Andersson (2017), namely that larger teams with shared facilities have more discussion than smaller teams. It is possible to conclude that team members can be more comfortable asking further questions from their teammates. This thesis does not claim that speaking in the team members' native language would be more favourable only to members of large teams. However, findings can confirm that a lack of familiarity might create a lack of knowledge sharing within the whole team, especially in larger teams, in which team

members are not familiar with each other. In this sense, it is vital for the team and the team's managers to maintain open knowledge sharing with active participation. A lack of familiarity also decreases interpersonal interaction, which is further discussed in Sub-chapter 6.3.

The second issue related to the lack of active participation is the presence of too large an amount of information and tasks. Morrison-Smith et al. (2020) have stated that communication technology should increase participation and reduce dominant members in the discussion. However, their study found that the use of the positive side of communication technology is more feasible when a team is smaller. Interviewees reported that only a few people in Project 1 actively took part in the discussion, which was recognised as a problem. The reasoning behind this was said to be the lack of background information from the management, which was also a problem in Project 2, as was the difficulty to be sure that every team member was on the same page. Even though Scrum Masters facilitated the discussion in both teams, the observation data shows that participation was relatively low in the large team but high in the small team. Several participants stated that an increased number of team members decreased the knowledge sharing and the possibility for active participation so much that they had to split the meetings and form sub-groups specialised for different components. This finding was also reported by Riedl et al. (2012) and complemented by the study of Marlow et al. (2017), who argued that increased communication paths might decrease the efficiency of communication because of geographical distance. This claim is related to information overflow, as Lowry et al. (2020) have predicted. As the observation and interview data shows, Project 1 was eventually forced to split into multiple meetings to maintain effective knowledge sharing, which eventually resulted in a lack of shared understanding. This topic will be further discussed in Chapter 6.3.

The last reason relates to communication technology, which is generally effective for the small team but occasionally ineffective for the large team. Often, as a solution for non-verbal and verbal cues, organisations use videoconference tools, which should increase the cognitive effort of and knowledge sharing between team members, leading to a higher quality of communication (Daim et al., 2012, 205). Contrary to Daim et al. (2012), this thesis predicts that large teams will benefit from communication tools as much as smaller teams. Löber et al. (2007) argue that small teams benefit from communication technology more than larger teams. More precisely, they indicate that smaller teams benefit from audio groups, whereas chat conversation is significantly more useful for large teams. Moreover, larger teams do not benefit from parallel audio groups due to their limited possibilities for sharing knowledge. The observation data revealed that the videoconference tool used by both teams showed only 11 screens simultaneously, which diminished the predicted benefit of a videoconference tool. In addition, it was more likely that all the team members of the smaller team used the web camera, as again the observation data reveals. Even though conference tools do

not fully replace face-to-face communication, it is possible to claim that smaller teams might benefit from the communication technology more than larger teams because they can perceive the non-verbal and verbal cues of all the team members. This data seems to partially contradict the study of Löber et al. (2007), who claim that large teams do not benefit from audio groups but instead that chat conversation is useful for large teams. The data indicate that, indeed, smaller teams benefit from audio groups. However, even chat conversations were not useful for the large team, as one interviewee reported that a large number of messages in the common chat channel would cause information overflow.

Teams need to find a suitable timeframe in which to hold their meetings, which is challenging because of temporal distance. Temporal distance has been argued to have a greater impact on communication than geographical distance (Ferrel et al., 2018; Morrison-Smith et al., 2020, 10). However, the thesis does not seem to be in align with this. Temporal distance is rather matter of coordination. The observation data shows that larger teams might have more difficulties in setting a meeting at a time suitable for everyone. In fact, observation data reveals that some members of Project 1 were part of other projects and that therefore they had to consider the times of those meetings when they made decisions. However, Project 2 also had employees involved in other projects, but these could more easily organise a meeting at a suitable time for everyone. These results reflect those of Riedl et al. (2012), who also found that coordinating a synchronous meeting became distinctly more challenging when the size of the team increased. Therefore, this thesis suggests that with a reduced team size there is a better possibility to organise synchronous meetings in temporally distributed teams.

Project success in a virtual team also requires coordinated communication when all team members are not available. Good coordination has been argued to be a result of effective communication. However, this thesis claims with the support of previous literature, that as a matter of fact, good coordination enables effective communication, especially in virtual teams. Nearly all interview participants mentioned that they faced some difficulties in communication due to the different time-zones. However, it is fundamental to note that the temporal distance did not decrease the quality of the communication, but instead, the time-zone difference required higher coordination than the organisation where all team members would be located in the same office. Several studies indicate that temporal distance can create a lack of overlapping working hours. For example, Morrisson-Smith et al. (2020) argue that fewer overlapping hours increase communication breakdowns and can lead to false assumptions and incorrectness, and repairing these misunderstandings decreases the effectiveness of communication. However, the findings of this thesis do not support previous research. This result may be explained by the fact that, even though the time difference was six hours, the majority of team members had enough time to interact with each other during the day. In fact, the most remarkable result to emerge from the data is that, in

contrast to other findings, temporal distance could possibly be used as an advantage also in daily communication, but as mentioned before, it required efficient coordination.

Larger teams depend on additional coordination to understand the current status of a project. It is possible for a larger team to maintain efficient communication, as Project 1 facilitated much more effective communication by creating additional coordination for asynchronous communication. However, the smaller team seemed to be more aware of the current status of the team members, as the interview data shows that Project 2 had no need for an additional status up-dates for team members to understand what employees achieved during the day.

Even though the coordination facilitated communication between teams in different time zones, it is critical to note that the large size of the team, combined with the presence of different time-zones, increases the need for an extra effort to maintain communication between all team members. Communication between team members from different time-zones is highly connected to coordination. However, the reduced size of a team can diminish the necessity for coordination.

Asynchronous communication is necessary for virtual teams. Morrisson-Smith et al. (2020) found in their study that asynchronous technology provides time to respond, which can lead to efficient conversation and the facilitation of unique ideas. This thesis supports that statement. Participants found it easier to ask questions or for additional information in Slack if the appropriate colleague for their specific question was unclear. However, similar to synchronous communication, the positive impact of asynchronous communication-technology seems to be higher in a small team.

The results of this thesis also demonstrate that it is possible to find relationships between team size, interruption in communication technology and knowledge sharing. The observation data, together with the interviews, revealed that daily internal communication between team members is challenged by communication technology. Although A. Ortiz de Guinea et al. (2012) and Lilian (2014) found that only temporal teams require highly functional communication tools combined with communication norms, the data shows that this is not necessarily the case. Both on-going (Project 1) and temporal (Project 2) teams required highly functional communication tools. There are similarities between the attitudes expressed by participants in this study and the paper described by Snellman (2014). The majority of respondents felt that, to communicate effectively, communication tools needed to be reliable, due to the high reliance of communication technology. Therefore, it is possible to claim that team size had an impact on communication technology, and even though communication technology enabled finding distant colleague easier also in larger teams, smaller team seems to have better possibility to exploit the advantage of communication technology.

Anderson et al. (2007) claim that social loafing in larger teams is mainly caused by the unreliable technologies they use. However, in contrast to that study, the interview answers from this study indicate that both of the teams regularly face difficulties

with technology. However, the observation indicates that the large team size has a negative impact on technology and that the larger team has more frequently emerging technical issues. Also, videoconference tools often have limited capacity. It is fundamental to note that the majority of interviewees reported that the use of a dysfunctional communication tool creates issues in communication and, in a worst-case scenario, misunderstanding or lack of knowledge sharing.

Regardless of the size of its teams, organisations should be able to identify the best communication technology tools to maintain effective communication. Still, having smaller teams might diminish the issues created by communication technology. Therefore, as the analysis shows, team size should be considered when organisations aim for effective knowledge sharing in virtual teams.

6.2 Shared understanding

This analysis highlighted three factors influenced by team size that impact the shared understanding of virtual teams and which were presented by interviewees and supported by observation. These main obstacles are:

- Task-related interaction
- Delays

Shared understanding is closely related to knowledge sharing and, more precisely, to forced team task distribution to maintain effective knowledge sharing. Hinds et al. (2003) underline that geographical distribution has a significant impact on task accomplishment and communication processes. More precisely, it affects the shared context of the team members (302). The result of this thesis is partly in agreement with Hinds et al. (2003). Geography seems to in fact affect communication processes and shared context, but the risk increases when the team is large. The thesis suggests, therefore, that team size has an impact on geographical distance. As mentioned in Sub-chapter 6.1, Project 1 split the meetings to form sub-groups specialised for different components. Additionally, a team organised knowledge-concentrated grouping with fewer people.

Team members were now able to have a shorter and more in-depth discussion. However, the split of the team created another issue, the lack of shared understanding, which affected the quality of the communication. Even though it seems that larger teams need to have concentrated knowledge meetings to achieve shared agreement and comprehension between team members, the data shows that it did not increase shared understanding in this case. That is, however, essential for team project success (Bittner & Leimeister, 2013). To achieve high-quality group discussion and shared

understanding, a team need to generate multiple perspectives, share knowledge and define and understand the problem at hand (Lowry et al., 2020, 634). This thesis suggests that, as a result of sub-group concentrated meetings, the whole team does not have enough in-depth understanding of the other team members' work or how their actions might affect the project outcome. Consequently, in a meeting with the whole team, team members cannot share understanding. In larger teams, the project's success requires dividing the team, but as a result, the task-oriented communication decreases. With the smaller team, the task-oriented communication and shared understanding seems to be easier to achieve, which should be considered when teams are formed. These findings strengthen the knowledge even further that the impact of geographical distance can possible be diminished with smaller team size.

Results were relatively mixed regarding meeting delays. It was not surprising to observe that team members from the larger team were more likely to be late from meetings than people from the small team. The observation data shows that in a daily meeting team communication was affected by delays due to the limited timespan for each meeting. The risk of delays seemed to increase when the team was larger. There is also a connection between communication technology, delays and the size of the team. When there is a higher amount of team members, members seem to have more difficulties with videoconference tools and Internet connection. However, in both teams, being late was not considered a problem, and regardless of nationality, the majority of respondents found it essential to be on time, as it was a matter of respect. This finding is contrary to previous theories of intercultural communication which have suggested that cultural factors would have an impact on lateness and its acceptance. Jones (1988) and Hall (1959) argue that protestant countries and individualistic cultures, like German's, emphasize that time should be used wisely, whereas this is not emphasized in other cultures.

An interesting finding is that only a few interviewees indicated that delays reduced the efficiency in communication. As findings show, the use of Confluence and Jira as tools to remedy the current status of each employee was identified as a possibility for maintaining effective communication. Therefore, delays were not identified as an aspect which negatively influence communication processes or knowledge sharing. It is understandable that the perception was that communication was effective even if someone was not participating in the meeting. In this sense, it is important to consider whether knowledge sharing is the actual purpose of a daily meeting. It is, however, possible to claim that delays actually have an impact on communication, especially when the timespan of the meeting is short. One interviewee stated the following about delays in meetings:

'If I have an issue and I need your help, I will communicate in the daily so you can help me and maybe we can take some other team member. From the company the need of daily is to give the report, right?'

Arguably, the purpose of the daily meeting is to share information and support team members. A missing person might have important information that the team requires. Even though the daily meeting within the Scrum framework is not to share detailed knowledge (Scrum.org), active participation of team members can increase knowledge sharing. The missing person could be vital for the discussion and communication process, which enable shared understanding. This strengthen the knowledge further that team size might have an impact on temporal distance. Therefore, this thesis suggests that, to minimise delays in meetings, organisations should consider the impact of team size.

6.3 Informal communication

Informal communication is a vital part of the team building and communication processes. Informal communication not only includes work-related matters, but it also consists of discussion about private and personal matters (Volkan et al., 2018). To share personal information, trust between team members need to be high. Therefore, team members need to build a relationship which enables open communication. Volkan et al. (2018) state that informal communication is characterised by spontaneity, familiarity and casual discussion. Röcker (2012) claims that the majority of innovative ideas are a result of informal interaction.

Additionally, informal communication maintains the social needs of employees, which is argued to be essential for teamwork. Therefore, it is arguable that a high amount of informal communication is essential for team success. Management members and team members should pay attention to informal communication, especially in virtual teams where it has been noted to be reduced because of the difficulty in communicating directly (Kauffmann, 2019, 158). As the findings of this thesis show, informal sharing is sometimes challenged by temporal, geographical, sociocultural and communication technology factors. The following sub-chapter introduces aspects of previously mentioned distance factors that impact teams' communication practices. Most importantly, these aspects have one thing in common: with smaller team sizes, these challenges can be prevented. This analysis highlighted three aspects influenced by team size that impact the informal communication of virtual teams. These aspects are presented by interviewees and supported by observation, and they are the following:

- Familiarity
- Feeling of "Teamness"
- Interpersonal interaction

The most relevant finding of this sub-chapter relates to the feeling of teamness in virtual teams. The lack of a feeling of teamness might decrease informal and formal discussion. It is closely related to the concept of familiarity. High levels of teamness and familiarity result in a strong identification to the team. This enables open discussion without fear of judgement, and in the most favourable of conditions, it increases creativity and problem-solving.

The main argument for a lack of teamness has been geographical distance. Sivunen & Laitinen (2007) found in their study, which distributed teams experience out-grouping due, in part, to geographical distance. One reason may be that there are no social context cues, which is arguably a result of computer-mediated communication. Members are not aware of the facial expressions, postures or tones of voice of other members, which might lower levels of interpersonal trust. As a result, a team member might feel more anonymous, and the focus may be on the person himself rather than on the team (Van der Kleij, 2007, 19). However, according to the interviews, large team size seems to result in a lack of teamness. Indeed, the data predicts that in large teams, people are more likely to feel that the team has sub-groups inside of a bigger team.

As mentioned earlier, teamness and familiarity are very closely related concepts and could be covered together as one. In this context, familiarity refers more to the knowledge or closeness between individuals. Teamness contains an assumption of closeness between multiple people in the same group and is a result of familiarity between team members. Therefore, they are covered separately in this thesis, even though as concepts, they support each other.

In a virtual team, lack of familiarity seems to increase doubt about how teammates perceive topics like jokes. However, this seemed to be the case only in large teams. Interviews showed that, after the management visited one part of the team in Argentina, an interpretation that someone perceives a joke wrong decreases in the smaller team. Smaller teams seemed to report more often that they were comfortable sharing personal matters, and team members from larger teams seemed to share personal matters more readily with team members from their own country. Consistent with previous findings, these results are related to trust between team members. Team members of a larger team seem to experience a lack of trust more often than team members of a smaller team. Therefore, it possible to claim that reduced team size enables a better feeling of teamness. An explanation for this is that small teams increase the appropriateness and openness of communication (Lowry et al., 2020, 657).

These result reveal two factors that an organisation should consider when they aim to maintain effective communication. Firstly, they must build a base for team communication, and leaders of virtual teams must find replacements for on-site discussion. Communication and information sharing needs to be diverse, frequent and supportive (Lilian, 2014, 1258). Well-coordinated, real-time, task-related and interpersonal

communication enable efficient communication, and these elements of communication are vital for shared norms, identity and a sense of teamness (Marlow et al., 2017, 581). This thesis suggests that team size have an impact on temporal, geographical, and sociocultural distance and communication technology factors. Except, team size does not seem to have an impact on national and language aspects of socio-cultural distance factor. This is aligning with the study of Trux (2005), which showed that cultural difference does not have an impact on team's communication.

However, smaller team size does not completely diminish the communication issues that virtual teams experience because of temporal, geographical, and sociocultural distance and communication technology factors, but it can diminish the challenges that virtual teams experience in their communication practices. Decreased team size is not a solution for effective communication, but it can be a base for it.

6.4 Limitations of the study

There are some limitations in this thesis. The first and major limitation of this study is researcher bias. It was possible to gather data from several different sources and the amount of data was high. To avoid an overload of information, the data that was collected was guided by research questions. However, it was difficult to decipher which information should be saved or ignored. That can be done more effectively by narrowing the research question (Rahm-Skakeby, 2011). The benefit of the mixed-method approach is that the possibility of being present during meetings gave real-life data of the team interaction. However, occasionally the limited internet access and crashing of videoconference tool Lifesize limited participation.

The second limitation is the nature of this case study. This study was performed by observing and interviewing only one medium-size multinational company, and it is unclear if these results can be implicated to other virtual teams. Other companies might already have employees who have work experience from virtual teams, which naturally has an impact on the experienced communication issues.

The third type of limitation is time. Both teams experienced many changes during the observation, and therefore there was a limited time frame when the amount of team members stayed constant. That determined the duration of the observation, which in this case occurred in June. It enabled proper observation during two sprints. There was also a short timeframe in which data could be compiled. For that reason, findings were based on a limited number of participants.

For privacy reasons, it was not possible to analyse the content of conversations or emails. Hence, some useful data was unable to be collected. The researchers also did not have access to all conversations. Access to these conversations would have

provided useful data because it would have been possible to observe how often the interaction was located on other channels than Slack and the videoconference tools.

Data for this study were collected using observation together with a reflective journal and semi-structured online interviews. The interviews were used as primary data because they enabled the gathering of real-life data on team members' experiences and perceptions. This was necessary to ensure that there was a minimal possibility for the misunderstanding about concepts (Fusch, 2017; Carlson, 2010).

The last limitation of the study is the definition regarding the size of the team. The definition of a large team can be wide. It is likewise challenging to define an amount of people that fulfils the definition of small. This thesis defines a team of 17 people as a large team and a team of 8 people as a small team, but previous studies have used other team sizes as the definition.

Regardless of the limitation, it is possible to expect that this thesis can provide essential information about the communication issues that globally distributed teams experience and how different team sizes determine the impact of these issues.

7 CONCLUSION

To conclude this study on internal communication in virtual teams, it is necessary to re-introduce research questions.

- How does the size of a team influence the communication distance factors in globally distributed teams?
- How is group size reflected in both teams' communication practices?

It Is possible to conclude that the study answered all research questions. Regarding the first research question, the present research aimed to examine whether reduced team size could help to prevent communication difficulties that are caused by temporal, geographical, sociocultural factors and communication-technology. It was possible to find that larger virtual teams might experience more communication difficulties that are caused by distance factors. There are two clear conclusions drawn from the result regarding the first research question. First, the result of the cyber-ethnographic case study suggests the impact of traditional communication distance factors in virtual teams do not seem to have a great impact on the communication process than has been predicted. Effects are not uniform among different teams.

The significance of the impact varied between distance factors. However, the smaller size of the team generally decreased difficulties that were caused by these factors. The qualitative results seem to be mostly in line with the previous findings only when the team size was large. As previous studies predicted, the geographical distance factor has the most significant impact on communication, but mostly when the team was large. More precisely, larger team size seems to decrease the feeling of teamness, communication process and task-related discussion. Surprisingly, the team size did not seem to have a significant impact on sociocultural distance factor seems to have an impact on communication. Except for familiarity and interpersonal interaction were better between team members who are part of a smaller team. Interestingly, contrary to previous studies, regardless of the team size, nationality and language diversity did not seem to have an impact on communication effectivity.

Communication-technology showed mixed results. Dysfunction of videoconference tools seems to be the significant problem that virtual teams experience regardless of the size of the team. It was reported to decrease communication quality in both teams, but the observation data showed that the broader team experienced most of the difficulties that distance factors caused. Right communication-technology tools were found to maintain efficient communication in both teams, but in larger teams, the necessity for functioning tools increase and is even required in order to communicate.

Temporal distance increased the necessity of flexibility and awareness of the working hours of team members, but these were not directly affecting communication but required better coordination. The finding implies that delays in a meeting do not create issues from the point of view employees, but on the contrary to interviews, the observation data indicated that team communication was affected by delays due to the limited time period for each meeting, and the risk of delays increase significantly when the team is larger. Regarding the second research question, this thesis indicates that the size of a virtual team does matter when the team aims to maintain effective communication practices. Communication aspects within distance factors that were influenced by team size seemed to have a great impact on communication practices. Especially knowledge sharing seems to be relatively more challenging in large teams. As mentioned, the data indicates that virtual teams experience communicational issues daily, and therefore, it is vital to explicate how these issues can be prevented. The conclusion is that the size of the team can be a moderator of communication and therefore also on performance. The thesis suggests that with a smaller team size knowledge sharing, shared understanding, and informal discussion can be more effective than in large teams.

This study has raised important questions about the necessity of expanding the team when the requirements of project increase. Thesis findings indicate that tendency to increase team size when the complexity of the project increases deteriorate the effectiveness of the team communication. It is possible to argue that communication quality decrease when the size of the team is larger, regardless of the requirement of the project. These results are encouraging. The present results are significant in one major aspect; Previously presented communication distance challenges can be prevented by just having smaller virtual teams, and even though when the complexity of tasks increase it is vital to consider keeping the size reduced. Thus, when planning to implement distributed teams, management needs to take the team size into consideration.

This thesis indicates that the size of a virtual team does matter when the team aims to maintain effective communication practices, and it can diminish challenges that have been predicted to be part of communication in globally distributed teams. However, due to the limited time and sample size future research is encouraged to continue to address these research questions that guided this work. Does the team size have an impact on traditional distance factors and how it affects communication practices in virtual teams? The field of intercultural communication and management could also benefit from a quantitative approach, which could provide better generalizability. It is necessary to understand how challenges in computer-mediated communication could be prevented. In addition, further ethnographic research is needed on the impact of team size in virtual teams as it enables an in-depth understanding of how the team size impact on temporal and on-going teams. As these results show, further research of real-life context is necessary for further studies. Often findings of

communication challenges in virtual teams have created inconsistent results, and research findings have been criticized for their lack of external validity and lack of real-world settings, which would ensure broader generalizability (Alaiad et al., 2019, 230). It is my understanding that study with all-encompassing ethnographic method about the impact of the team has not previously conducted in academia. Therefore, this study can offer valuable information regarding the impact of communication distance factors, and particularly how the reduced team size influences these factors.

Finally, from an organizational standpoint, it is necessary to gain knowledge on how to determine the definition of a large team. Additionally, we need to understand does the team size have an impact on communication in other organizations than a private organization.

In this study, employees gave an overview of their communication and how they experience internal communication in globally distributed teams. As the thesis shows, employees' prediction of which factors have an impact on communication varied from previous researches that have been conducted. The prediction of the impact varied, even from the observation that was conducted during the research. Therefore, in the future, it would be interesting to have more insight into how employees interpret communication in globally distributed teams. Moreover, it would be interesting to analyse further differences between employees and managements perspectives on communication and which factors affect interaction negatively.

All in all, virtual teams need to maintain active interaction and knowledge sharing because efficient communication can be reached when everyone shares a common understanding. As one interviewee said:" In the end, a virtual team can only exist if everyone is on board."

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APPENDICES

APPENDIX 1

Interview questions

1. How does geographical distance (team members located in different places) affect communication?

2. How does temporal distance factor (different time-zones, delays) affect communication?

3. How does sociocultural distance factor (language, organisational culture and values national culture) affect communication?

4. How does the size of the Team affect communication in this project/overall?

5. How does the virtuality (Team members are co-located, and therefore rely on communication technologies, such as e-mail, telephone, instant messaging, wikis, and videoconferencing for interaction) affect communication?

6. How would you evaluate the communication in this project/overall?

7. How would you evaluate team meetings? (dailies, retro, planning, grooming, review)

8. What communicative rules do team members draw on to be effective as a team? (For example, a rule that everyone needs to be on time, turning microphone off when you are not talking, reply if someone asks something in the chat)

9. How can better communication be reached?

10. How were you integrated into the organisation/team when you started working?