

Communication Mechanisms in Global Virtual Teams and Influencing Factors of Team Effectiveness

vorgelegt von
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an der Fakultät V – Verkehrs- und Maschinensysteme
der Technischen Universität Berlin
zur Erlangung des akademischen Grades
Doktorin der Ingenieurwissenschaften
– Dr.-Ing. –
genehmigte Dissertation

Promotionsausschuss:

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Gutachter: Prof. Dr. Burcu Toker

Tag der wissenschaftlichen Aussprache: 03. Juni 2022

Berlin 2022

Acknowledgements

This dissertation is the result of my doctoral research work at the Chair of Human-Machine Systems at the Technische Universität Berlin.

First and most I would like to thank my advisor Prof. Dr.-Ing. Matthias Rötting for taking on the challenge of a long-distance research relationship. He was incredibly patient with me and inspired me to work hard and think a step further. This made him the best supervisor I could have imagined, and I am very thankful to having had the opportunity to work with him.

I would like to express my deepest appreciation to my committee I'm deeply indebted. I also would like to thank Prof. Dr.-Ing. Henning Jürgen Meyer for his feedback and insights.

I would like to acknowledge the feedback and insight of Prof. Dr. Burcu Toker which had a major impact on the quality of this research.

I am very grateful for the opportunity to work in the creative environment of the Chair of Human-Machine Systems.

I am very thankful to my family, in particular my parents Gülay and Mehmet Celik, and my brother Mert Celik for their endless support over the decades and particularly in the years of my undergraduate and the master's that led to this PhD.

Lastly, I would like to give my warmest thanks to my husband Onur Unal for encouragement and patience during the years of my studies and the process of this thesis. Finally, I am at a point where he can spend all the time with his wife which he could not do over the last four years.

Communication Mechanisms in Global Virtual Teams and Influencing Factors of Team Effectiveness

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Declaration of Originality

Hereby I declare that I wrote this thesis myself with the help of no more than the mentioned literature and auxiliary means.

Berlin, 03.06.2022

BUKET CELIK ÜNAL

Communication Mechanisms in Global Virtual Teams and Influencing Factors of Team Effectiveness

Zusammenfassung

Heutzutage gewinnen virtuelle Teams immer mehr an Bedeutung, da sie Unternehmen und Mitarbeitern die Möglichkeit geben, von jedem Ort der Welt aus zu arbeiten, ohne dass sie ihren Standort verändern müssen. Die Mitarbeiter müssen nicht mehr physisch an einem Ort sein, um an demselben Projekt arbeiten zu können. Viele Unternehmen nutzen die Globalisierung und die Fortschritte in der Kommunikation, um von jedem Ort und zu jeder Zeit neue Märkte zu erschließen. Darüber hinaus hat die weltweite Verbreitung von COVID-19 dazu geführt, dass auch in der Informationstechnologie (IT) alternative Arbeitsformen gesucht werden. Viele Unternehmen setzen mithilfe von Kommunikations- und Informationstechnologien globale virtuelle Teams in globalisierten Geschäftsumgebungen über räumliche, zeitliche, organisatorische und kulturelle Grenzen hinweg ein. Trotz des technologischen Fortschritts gibt es immer noch viele Herausforderungen bei der Kommunikation und Zusammenarbeit in globalen virtuellen Teams. Daher ist es sehr wichtig, die Herausforderungen, denen virtuelle Teams gegenüberstehen, und die Faktoren, die die Effektivität virtueller Teams beeinflussen können, zu ermitteln. Darüber hinaus kann das Verständnis der Rolle der Teammitglieder, der Teambesetzungsstrategie, der Planung kollaborativer Arbeitsprozesse und kontinuierlicher Wissensmanagementsysteme in virtuellen Umgebungen Organisationen helfen, effektiv zu arbeiten.

Die Arbeit in einem virtuellen Umfeld hat viele Herausforderungen und Vorteile. Wenn die Teammitglieder über Zeitzonen und kulturelle Unterschiede hinweg verstreut sind, ergeben sich Herausforderungen wie Sprachbarrieren, Missverständnisse, mangelndes Vertrauen, Entfernung, fehlende Planung usw. Andererseits können virtuelle Teams durch Kostenminimierung Geld sparen, was in vielen Unternehmen von großem Interesse ist. Global tätige Unternehmen bevorzugen es, mit verstreuten Mitarbeitern zu arbeiten, um schneller und flexibler zu sein. Die face-to-face Kommunikation, zumindest von Zeit zu Zeit, scheint jedoch auch in virtuellen Umgebungen wichtig zu sein. Unternehmen beginnen, Teams zu bilden, um Personen mit spezifischen Fachkenntnissen und Fähigkeiten zusammenzubringen, die an komplexen Aufgaben zusammenarbeiten. Das Zusammenwirken ist ein wichtiger Faktor in der virtuellen Teamarbeit. Die Teammitglieder müssen zusammenarbeiten, um das Projektziel zu erreichen. Der Vorteil eines virtuellen Teams ist, dass verteiltes Wissen integriert wird, um effektivere Ergebnisse zu erzielen. Die gemeinsame Nutzung von Wissen hängt jedoch von der Bereitschaft der einzelnen Teammitglieder ab, und die gemeinsame Nutzung von Wissen kann zu einem Verlust des eigenen Wissens jedes einzelnen führen. Dies kann dazu führen, dass die Mitarbeiter nicht bereit sind, ihr Wissen zu teilen. Da der Wissensaustausch für die

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Zusammenarbeit im Team von entscheidender Bedeutung ist, erfordert ein effektives virtuelles Team einen regelmäßigen Ideenaustausch. Ein weiterer Schlüsselfaktor ist das Vertrauen, das die Effektivität und den Erfolg eines Teams beeinflussen kann. Der Aufbau von Vertrauen zwischen den Teammitgliedern ist jedoch in virtuellen Umgebungen eine komplexe Aufgabe. Virtuelle Teammitglieder können sich nicht persönlich treffen und müssen sich daher auf virtuelle Umgebungen verlassen, um die Vertrauenswürdigkeit zu beurteilen und den Mangel an physisch beobachteten Verhaltensweisen auszugleichen.

Diese Studie beschreibt mehrere wichtige Faktoren, die sich insbesondere bei IT-Projekten auf die Effizienz globaler, virtueller Teams auswirken, und es werden die zugrunde liegenden Lösungen zum Abbau der Hindernisse behandelt. Daher erweitert diese Forschungsarbeit die Literatur über virtuelle Teams durch die Untersuchung der Beziehung zwischen Wissensaustausch, Vertrauen, Sprachunterschied, kulturellem Unterschied, Entfernung, Zeitzoneunterschied und Faktoren der Teameffektivität sowie der Zusammenarbeit zwischen den Teammitgliedern und wie diese Faktoren letztendlich die Effektivität virtueller Teams beeinflussen. Es wird ein konzeptionelles Modell vorgeschlagen, das die Beziehung zwischen den Faktoren (die sich auf die Effizienz virtueller Teams auswirken) und der Teameffektivität erklärt. Diese Faktoren wurden aus einer industriellen Fallstudie gewonnen, die sich über drei Jahre erstreckte und einem Entwicklungsprojekt zur Software-Testautomatisierung entsprach, an dem mehrere globale virtuelle Teams beteiligt waren. Das Modell wird durch eine Umfrage unter virtuellen Teammitgliedern getestet, die an einer zufälligen Auswahl von Projekten arbeiten. Darüber hinaus wird in dieser Studie die hypothetische Beziehung zwischen Wissensaustausch, Vertrauen, Sprachunterschied, kulturellem Unterschied, Entfernung, Zeitzoneunterschied und Teameffektivität in virtuellen Teams definiert. Nach der Literaturrecherche und der Entwicklung der hypothetischen Beziehungen befasst sich die Studie mit der Effektivität von Kommunikations- und Koordinationsmechanismen für IT-Projekte in globalen virtuellen Teams. 417 Teilnehmer aus verschiedenen Branchen, die meisten jedoch aus der IT-Branche, nahmen an einer Umfrage teil, um herauszufinden, welche Faktoren die Effizienz virtueller Teams beeinflussen. Aufgrund der COVID-19 Pandemie trägt diese Studie auch zu einer neueren Untersuchung in virtuellen Umgebungen bei, um besser zu verstehen, was zur Teameffektivität beiträgt.

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Abstract

Nowadays, virtual teams are gaining importance because it has given organizations and employees the ability to work from anywhere in the world without relocating them. Employees no longer need to be physically co-located to work on the same project. Many organizations have been taking advantage of globalization and communication advances to enter new markets from anywhere and anytime. Additionally, the COVID-19 spreading in the world, this has resulted to seek alternative work arrangements, including the information technology (IT) industry. Many companies implement the global virtual teams in globalized business environments across space, time, organizational and cultural boundaries via communication and information technologies. Despite the advancement of technology, there are still many challenges in communication and collaboration for global virtual teams. Hence, identifying challenges that may face virtual teams and factors that may influence the effectiveness of virtual teams is very important. Moreover, understanding the role of the team members, team staffing strategy, planning collaborative work processes, and continuous knowledge management systems in virtual settings can help organizations work effectively.

Working in a virtual environment has many challenges and advantages. When team members are dispersed across time zones and cultural differences, challenges occur, such as language barriers, misunderstandings, lack of trust, distance, lack of planning, etc. On the other hand, virtual teams can save money by cutting costs which is a major concern in many organizations. Global companies prefer working with a dispersed workforce to be quick and more agile. But face-to-face communication, at least from time to time, appears still significant for virtual environments. Organizations start to establish teams to bring individuals together with the specific expertise and skills to collaborate on complex tasks. Collaboration is an important factor in virtual teamwork. Team members need to collaborate to achieve the project goal. The advantage of a virtual team is that distributed knowledge is integrated to achieve more effective results. However, knowledge sharing is dependent on the willingness of individual team members and sharing knowledge may lead to a loss of knowledge ownership. This can lead to a reluctance to share knowledge by employees. As knowledge sharing is crucial for team collaboration, an effective virtual team requires regular idea exchange. Another key factor is trust which can affect team effectiveness and success. However, building trust among team members is a complex task in virtual environments. Virtual team members are unable to meet face-to-face therefore, they need to rely on virtual settings to assess trustworthiness and compensate for the lack of physically observed behaviors.

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This research describes several important factors that affect global virtual team efficiency, especially in IT projects and underlying solutions are addressed to reduce the barriers. Hence, this research extends the literature on virtual teams through investigating the relationship between knowledge sharing, trust, language difference, cultural difference, distance, time zone difference, and team effectiveness factors, and collaboration among team members and how these factors ultimately affect virtual team effectiveness. A conceptual model is proposed which explains the relationship between the factors (that affect virtual team efficiency) and team effectiveness. These factors are obtained from an industrial use case study that lasted 3 years corresponding to a software test automation development project that involved several global virtual teams. The model is tested by a survey of virtual team members working on a random set of projects. Additionally, this research defines the hypothesized relationship between knowledge sharing, trust, language difference, cultural difference, distance, time zone difference, and team effectiveness in virtual team settings. After the literature review and the development of the hypothesized relationships, the study is addressing the effectiveness of communication and coordination mechanisms for IT projects for global virtual teams. 417 participants from different industries but the majority from the IT industry, participated in a survey to reveal the importance of how factors affect virtual team efficiency. Due to the COVID-19, this research also contributes to a recent investigation in virtual settings to better understanding what contributes to team effectiveness.

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1 Introduction

The digital era has changed in the process and routines thus organizations had to adapt to globalized markets. This implies a challenge for the teams for collaboration who are dispersed geographically. In addition to this, a pandemic (COVID-19) has forced organizations for remote work (Garro-Abarca et al., 2021). Nowadays, projects are being formed by people with different backgrounds (Popescu et al., 2014). Global teams are qualified by national, cultural differences and work in the global virtual environment (Zander et al., 2012). Different options of communication are available and virtual teams are increasing in organizations (Eubanks, et al., 2016). Virtual teams are becoming more frequently implemented within organizations (Marlow et al., 2017). Organizations are responding to the increasing de-centralization work processes by introducing virtual teams that collaborate by communication technologies across geographical, cultural, and organizational boundaries to achieve a common goal. Information technology provides the necessary infrastructure to support the development of virtual environments. Virtual teams represent large know-how that is a promising source of innovation (Ebrahim et al., 2009). In modern organizations, the intercultural dimension is very common. People with different cultural backgrounds, work together, bringing creativity, new ideas, and new approaches to problem-solving. It is very important to understand the cultural differences influenced by age diversity, gender, religions in a project team. A global team is formed by individuals with different job functions and team members could come from different areas of expertise. Culture should not be a barrier, it can show different options to problem-solving (Popescu et al., 2014).

Teams are the building blocks of an organization. In the teams, various skills, talents of group individuals come together to achieve the goals. In traditional teams, team members used to work collocate because of the high levels of interdependencies in group work. Currently, companies are started to organize projects over distance, with people who are based in different locations, with different cultural backgrounds. In the past, some researches showed that even the smallest degrees of dispersion, such as working on different floors in the same building, can affect the quality of collaboration. Virtual teams provide benefits but incur costs as well. Therefore, companies need to manage the virtual teams in specific ways. Table 1 shows the opportunities and liabilities of virtual teams (Siebdrat et al., 2009).

1 Introduction

Table 1. Opportunities and liabilities of virtual environment (adapted from Siebdrat et al., 2009)

Opportunities	Liabilities
<ul style="list-style-type: none">• Cost advantages• Access to diverse skills and experience• Knowledge about diverse markets• Heterogeneous knowledge resources	<ul style="list-style-type: none">• Language differences• Fewer face-to-face interactions• Cultural incompatibilities• Good teamwork more complexities to solve

1.1 Background

Today the boundaries of the world have expanded. It is clear that COVID-19 has forced the majority of workers to work remotely (Garro-Abarca et al., 2021). Business is taking it to the next level with new technologies. Virtual teams allow organizations to improve productivity, and transfer information among team members. Virtual teams have to rely on IT and have rarely face-to-face interaction thus, problems are increasing in terms of location barriers, time differences, language differences and cultural differences (Pinjani and Palvia, 2013). In the picture of a perfect world, technology helps to over-cross boundaries for productive and effective cooperation. Future is in the technologies with the help of virtual teams, which have no barriers on time zones, geographic location, face to face interaction, culture or any other factors (Velikodnaya, 2018). Although various technologies offer many benefits, technological complexities can result in delayed communication and decreased productivity and effectiveness. Problems are complicated in virtual environments because team members may not want to share knowledge because they think their idea will be stolen and used by competitors. If teams cannot establish a communication base, it will cause difficulty in understanding the importance of information and it will be hard to establish trust in a working relationship (Pinjani and Palvia, 2013).

1.2 Research Problem and Scope

A virtual team is an alternative way of managing and organizing work that allows people to work together, even though they are geographically and culturally distributed. In virtual team people use technology to communicate rather than face-to-face communication or traveling. Recently, companies turned to virtual teams connecting and engaging geographically distributed people, lowering the costs and enabling greater speed for the projects. Although, virtual teams offer many advantages, also pose a number of challenges. Developing effective leaders, keeping remote team members engaged, developing global teams are the areas in that companies are working for a better virtual environment (Rosa, 2013).

1 Introduction

In virtual team settings, there are some factors that affect virtual team efficiency. Language differences, geographical dispersion, time zone differences, cultural differences, difficulties in building trust and communication are particularly common in IT projects. These problems are expanded when the teams have to work across distances (Guzmán et al., 2013). This study has been done during COVID-19 impact on virtual teams and describes the factors influencing virtual team efficiency for software test automation project and underlying solutions that are addressed to reduce the challenges. These factors are gathered from a case study with different companies, from a software test automation project that involved several global virtual teams. It is foreseen that virtual teamwork is very important for gathering the teams together. In addition to this, due to the COVID-19 many participants from different companies and industries, who are working remotely, participated in the survey and their responses are evaluated and included in this study. Consequently, the idea of this research is to get a better understanding of virtual team influencing factors that affect the project outcomes, coordination/communication mechanisms, and collaboration. The results of this study will provide information for the implementation of virtual team strategies for effective virtual teams and also virtual team strategies in post-pandemic work.

1.3 Research Questions

Virtual teams are becoming common in organizations. Virtual teams are working in a variety of areas and they are geographically and culturally dispersed (McDonough et al., 2001, Carmel and Agarwall, 2001).

The purpose of this research is to investigate the hypothesized relationship between knowledge sharing, trust, time zone difference, cultural difference, distance, language difference, and team effectiveness among virtual team members. Multidisciplinary teams are working in different locations on the same project. In addition to this, due to the COVID-19 more and more companies start to work remotely. As a consequence of this, the software industry is becoming the organizational response to global virtual work. But managing remote teams is not an easy task because of the challenges and additional problems. The specific challenges that need to be taken into account are:

- Team members are in a different location/country.
- Team members come from different cultures and have different work styles. This can be a potential conflict in global virtual teams. On the other hand, this can a very positive impact on success since each person looks at the problems from a different angle.

1 Introduction

- Team members speak different languages. Although English is the working language. There are different levels and accents.
- Knowledge sharing and management are different as knowledge is distributed among the different tools and sites.
- Communication, collaboration, and meetings rely on computer-supported technologies. So, everybody should be able to access the tool and use it efficiently.
- Team members are based on different locations/countries, this makes it difficult to set the meetings managing the agenda.

Consequently, many organizations found that virtual teams are very complex (Guzmán et al., 2013). This complexity comes from the challenges they face:

- Lack of understanding the goals of the project, lack of communication, collaboration, trust, knowledge sharing.
- Difficulties in communication because of the distance.
- Differences between skills of team members.
- Difficulties of knowledge sharing among team members which may cause duplication or lack of knowledge.
- Differences in language, time zone, cultural diversity, ineffective management, lack of understanding of project requirements.

So, these factors are investigated in detail and the following research questions will be covered in this research:

1. What are the benefits and problems of a virtual team?
2. What are the challenges of virtual teams?
3. What kind of methods virtual teams are using today and how effective are they?
4. What are the success factors for virtual teams?
5. What are the impacts of virtual team issues (trust, language difference, time difference, knowledge sharing, cultural difference, distance) on team performance and on the effectiveness of plans/standards and formal/informal mutual coherence?

Answering these questions will allow a better understanding of virtual teams and the factors which influence their effectiveness. This study will also provide guidance to teams and organizations about how to design and manage virtual teams to enhance team effectiveness.

1.4 Outline of Dissertation

This research focuses on the effectiveness of virtual teams and the influencing factors of team effectiveness such as trust, knowledge sharing, distance, cultural difference, time difference, and language difference.

Chapter 1 describes the background and research questions.

Chapter 2 describes virtual and traditional teams and the advantages/disadvantages of both teams are discussed here.

Chapter 3 describes the challenges and systematic design approach /principles in virtual teams.

Chapter 4 describes the framework and technology point of view for working across boundaries.

Chapter 5 describes the research model.

Chapter 6 describes the case study, research method, and hypotheses.

In chapter 7 hypotheses results are analyzed.

In chapter 8 results of the hypotheses are shown, future research and limitations of the research are discussed.

2 Virtual Team Origin and Team Orientation

According to Dictionary.com, the word “virtual” meaning is coming from “virtue” in the early 14th century. By the late 1950s, it had a new meaning of “temporarily simulated by computer software”. In the recent past, a group of people from the same different cultures, at one place working together to achieve a defined goal. PCs sales are increased in the 1960s followed by cellular phones in the 1970s, voice mail in the 1980s, and the internet in the 1990s gradually improved for the virtual environments. Nowadays, a new form of organizational structure has emerged, which is virtual teams, and they are the latest working group that faces and copes with challenges and boundaries in a corporate environment of the 21st century (Juneja and Management Study Guide.com).

Virtual teams are in adaptive and changing environments. This can cause chaos and decrease the team`s performance. While developing a team it is necessary to understand the team direction at the beginning. For instance, in traditional teams, if the starting point is defined, daily communication of team members can add value for shared understanding between team members. In virtual teams, the lack of physical communication can cause misunderstandings. That`s why the tasks must be well planned and reinforced because virtual teams have to overcome so many boundaries. The ideal orientation is a face-to-face meeting for all team members. Currently, there is no technology that can provide the feeling of human interaction through a face-to-face meeting. In virtual teams, mostly face-to-face communication is not possible thus, an audio conference or video conference is the best alternative for effective communication. In virtual environments, all team members should understand their roles and the tasks of the team. The roles of external partners must be defined as well. Another important point is establishing the team norms. This helps to clarify expectations for all people who work within the team. Team norms guide communication, conflict management, meeting management, problem-solving, and decision making. Virtual teams need more detailed norms than collocated teams. Consequently, the following list of activities should be considered in team orientation (Duarte and Snyder, 2001):

- Every team member should participate in a face-to-face or phone meeting to understand the team`s purpose, objectives, deliverables, schedules, and the roles and responsibilities of other team members.
- The next step is introducing the new team member who will provide important information about the team`s operations.

2 Virtual Team Origin and Team Orientation

- The new team member and his or her partner(s) also should participate in the introduction session to answer the questions about the roles of other team members and to give feedback about the norms and processes.

In summary, a team orientation process is significant for virtual teams. If possible, it is better to conduct the team orientation session face-to-face otherwise audio/video conference is an alternative way for the meeting. Finally, the leader should explain team norms, technological plans, and communication plans to the teams.

2.1 Definition of Team and Virtual Team

A team is a group of people who are focusing to achieve a defined goal. Team members collaborate with a high degree of interdependence, share responsibility for self-management, and work toward a common goal (Jain, 2009). A virtual team is a group of people who work with a shared purpose across space, time, and organizational boundaries using technology to collaborate. Virtual team members can be located across a country from different cultures and they rarely meet face-to-face (Kimble et al., 2000). Virtual teams have several unique characteristics which are mainly, 1) physically distributed members, 2) communication through a number of synchronous and asynchronous methods. There are different researches in the literature and according to Duarte and Snyder (2006), it is easy to characterize virtual teams as traditional teams. However, virtual teams are more complex as they have time differences, distance, different organizational structures and they use information technology to communicate and collaborate (Rosa, 2013). Although virtual teamwork is a current topic in literature it is difficult to define the complexities and clear solutions. The team is described as a small number of people with different backgrounds who are committed to achieving a common goal. Virtual teams work across boundaries of time, space by using computer-driven technologies (Chudoba et al., 2005 and Anderson et al., 2007). Virtual teams included members who are located in different physical locations. They use different forms of computer-mediated communication to coordinate (Peters and Manz, 2008). Another definition mentions that virtual teams are distributed work teams whose members are geographically in different locations and coordinate the work with electronic communication technologies (Hertel et al., 2005). From the perspective of Leenders et al. (2004) virtual teams are groups of individuals collaborating through a specific project while geographically distributed. Lurey and Raisinghani (2001) defined virtual teams that “group of people who work together although they are geographically in a different location”. Amongst the different definitions of a virtual team, the concept from Powell et al. (2004) is the most widely accepted definition. They define virtual teams as groups

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of geographically, organizationally and time dispersed workers to achieve the organizational tasks. Consequently, a summary of the definition of a virtual team can be defined as, a group of geographically, and time dispersed workers collaborating with computer-mediated communication technologies in order to achieve the common goal for organizations.

2.2 Types of Virtual Team

There are various forms of virtual work that can be differentiated depending on the number of people involved and interaction between them. The first type is teleworking which is partially or completely outside of the company workplace by using information and communication services. Teleworking eliminates time-consuming activities and offers employees more flexibility to coordinate their work (Hertel et al., 2005 and Johnson et al., 2001). A virtual team is classified to two primary variables which are the number of locations and the number of managers, one or more. Thus, there are four types of virtual teams (Cascio and Shurygailo, 2003):

1. **Teleworkers:** One manager of a team at one location
2. **Remote team:** A single manager of a distributed team across multiple locations
3. **Matrixed teleworkers:** More than one manager of a team at one location
4. **Matrixed remote teams:** More than one manager of a team across multiple locations (Ebrahim et al., 2009).

Consequently, computer-mediated communication technology allows team members asynchronous interactions through e-mail, instant messaging, and synchronous interactions through videoconferencing, shared workspace, chat and other features and engage in collaborative work (Rice et al., 2007).

2.3 Virtual and Traditional Teams

Virtual teams are different from traditional teams (Kratzer et al., 2005). Unlike a traditional team, a virtual team works across distance, time, and organizational boundaries by using communication technologies (Bergiel et al., 2008). In traditional teams, team members work in the same location, while virtual teams work in different locations. In traditional teams, the coordination of tasks is performed by team members together; in virtual teams, tasks must be done more independently. Additionally, virtual teams rely on computer-supported communication, as opposed to face-to-face communication in traditional teams (Kratzer et al., 2005). Table 2 shows an overview of the main characteristic of virtual versus traditional teams.

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Table 2. Characteristics of traditional vs. virtual teams (adapted from Kratzer et al., 2005)

Fully Traditional Teams	Fully Virtual Teams
Team members are co-located.	Team members are all in different locations.
Team members communicate face-to-face (i.e., synchronous).	Team members communicate through asynchronous interactions.
Team members coordinate tasks together.	The task is highly structured and coordination by team members is rarely necessary.

In virtual organizations, communication is strongly facilitated by information technology (Ojasalo, 2008). Cummings and Teng (2003) mentioned that virtual teams have more effective R&D decisions than face-to-face teams because virtual teams have computer-supported communication, and this allows for more time to research. Another study classified the differences between virtual teams and traditional teams. Table 3 shows the classification of virtual teams versus traditional teams.

Table 3. Classification of virtual teams versus traditional teams (adapted/updated from Juneja and Management Study Guide.com)

Activity	Traditional teams' structure	Virtual teams' structure
Interaction	Opportunity to share work information and social life	Exchange of informal information is minimal
Utilization of resources	Higher opportunity for sharing of resources	All teams and organizations should have access to materials
Working environment	Accessing information and interacting with others within the company	Sometimes it is not possible to share ideas with other partners
Cultural and educational backgrounds	Team members are likely to have similar and complementary cultural and educational background	Team members vary in their education, culture, language, expertise, and time zone
Management and control within the project	The project manager provides feedback for ongoing activities thus enhancing their ability to respond to the requirements	The collaborating partners are accountable to the task leaders and the project coordinator who has a limited authority to enforce any penalties for failure to achieve the task

Consequently, interaction in computer-mediated communication environments is more impersonal, more task-oriented, more business, less friendly than in face-to-face meetings (Smith, 2003). However, virtual collaboration could be effective with face-to-face communication support from time to time which would lead to higher levels of satisfaction in collaboration (Staples and Zhao, 2006).

2.4 Virtual versus Natural (Face-to-face) Communication

Nowadays, organizations implement various virtual communication tools. As technology has developed, time and distance barriers have been solved and virtual communication offers many advantages. Although virtual communication offers many advantages it has disadvantages as well (Dewar, 2006). Virtual communication and natural communication are both powerful in both personal and professional life, but they are very different from each other. They both have advantages and disadvantages, and they should be used appropriately.

2.5 Advantages and Disadvantages of Natural Communication

2.5.1 Advantages of Natural Communication

Natural communication is face-to-face communication that is used in traditional teams. Natural communication is characterized through the use of personal contact which facilitates communication. Because during face-to-face communication it is possible to see physical motions, hand gestures, speech patterns, and facial expressions. Also, it is possible to understand the meaning of the communication because of the tone of the voice (Duke, 2001). Face-to-face communication has several advantages, for instance, while building trust face-to-face communication enables people to know one another's background, skills, and experiences. In addition to this, while communicating it is possible to make rapid adjustments with visual cues from the people (Storper and Veneblas, 2004). Consequently, face-to-face communication is the most trusted mode of communication, but it has disadvantages as well.

2.5.2 Disadvantages of Natural Communication

While face-to-face communication has positive aspects, it has negative aspects as well. Natural communication allows transferring emotions, but things can be misunderstood if it is not expressed correctly due to lingual or cultural barriers. Additionally, business travel is too costly for face-to-face contact between co-workers or clients (Storper and Veneblas, 2004).

2.5.3 Summary

Face-to-face communication has advantages and disadvantages. Both advantages and disadvantages of face-to-face communication are shown in the table below.

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Table 4. Advantages and disadvantages of face-to-face communication (adapted from Rosa, 2013)

Advantages	Disadvantages
<ul style="list-style-type: none">• Building trust easier• Presence of physical motions, facial expressions• Easy to make rapid adjustments with visual cues	<ul style="list-style-type: none">• Prominent power differences• Costly (business trips)• Misunderstandings while transferring emotions

2.5.4 Advantages of Virtual Communication

Virtual communication has many advantages. Due to globalization and the need for rapid knowledge transfer across borders and time zones, computer-mediated technologies allow users to communicate at any time and any location with access to the technology. Virtual teams overcome the limitations of time, space that traditional teams have. Moreover, virtual communication allows you to think about your response before you send an e-mail or reply to a message which reduces misunderstanding (Baltes et al., 2002). On the other hand, virtual communication provides cost savings to employees and to companies as well (Johnson et al., 2001). In addition to cost savings, a virtual working environment encourages innovation. Because in virtual teams' productivity is much more important than other characteristics (Bergiel et al., 2008). Although, virtual communication has various benefits in terms of cost, distance, cultural difference, and access to expertise it has disadvantages as well.

2.5.5 Disadvantages of Virtual Communication

Virtual communication has software problems from time to time which causes delays or cancellations (Powell et al., 2004). This causes rescheduling the timetable which can be difficult to schedule the meeting again due to time zone barriers. In addition to this, technological expertise issues arise in virtual environments. Some team members do not feel comfortable enough with technological structure. Indeed, one of the most important disadvantages is the lack of team cohesion and trust. Because sometimes people need to see or even feel to understand what people think. Because virtual team members often assume others' intentions incorrectly when they do not respond to e-mails or messages (Bergiel et al., 2008 and Dewar, 2006). These assumptions can cause conflict which is difficult to manage in virtual teams and negatively affects efficiency (Hertel et al., 2005 and Rosen et al., 2007). Consequently, studies showed that both virtual and face-to-face communication has advantages and disadvantages. Therefore, it is important to use communication modes appropriately in a certain situation.

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2.5.6 Summary

Virtual communication has advantages and disadvantages. Both advantages and disadvantages of virtual communication are shown in table 5 below.

Table 5. Advantages and disadvantages of virtual communication (adapted from Rosa, 2013 and Ebrahim et al., 2009)

Advantages	Disadvantages
Reduced travel costs.	Technical problems and complex technological applications.
Allows communication across time zones and locations.	Difficult to schedule.
Enables access to experts.	Cultural and language problems.
Self-assessed and high performance.	High level of interpersonal conflict and challenges of managing conflict.
Respond quickly to changing business developments.	Lack of social presence and physical interaction.
Enable organizations to respond faster.	Developing trust among team members is difficult.
Reduce training expenses.	Team members need special training and encouragement.
Better team outcomes (quality, productivity, and satisfaction).	Tasks should be much more structured.
More effective R&D decisions.	Team members who are uncomfortable with telecommunication technologies will have difficulties.
Greater productivity, shorter deadlines.	Cultural differences, language differences, and work process diversity can affect virtual team performance negatively.
On-time implementation of the tasks assigned.	
Providing flexible hours for the employees.	
The ratio of R&D publications from virtual members is higher from co-located teams' publications.	
Virtual teams can manage the development and commercial tasks better.	
Improve communication and coordination and encourage mutual sharing between organizational resources.	
Team communications and work reports are available online to facilitate responses to the demands.	

3 Challenges and Systematic Design Principles

Virtual teams are a group of people who work across space, time, and organizational boundaries with electronic communication. Most project teams work which includes working from different time zones, geographical locations, firm-wide boundaries, or with other third parties. However, virtual teams face various challenges due to a lack of face-to-face interaction. In this section, there will be an insight into the major and common virtual team challenges and their management (ezTalks, 2017).

3.1 Introduction

Technological and organizational evolutions shape new virtual teamwork, distributed collaborators have to work together and achieve high performance (Guegan et al., 2017). Virtual teams are crucially different from traditional teams. Because virtual teams rely on electronic communication and they are required to use technologies as opposed to face-to-face communication in traditional teams (Kratzer, et al., 2005). Several studies showed that collaboration across distance is more difficult than a face-to-face environment. Potential difficulties are communication and collaboration, reduced trust, cultural differences, language difference problems. Indeed, the physical presence of workers improves people's feelings of proximity and strengthens social life. In contrast, a virtual environment decreases team proximity, which can lead to a potential for conflict. Dispersion also brings other issues, such as team members have to negotiate in different time zones required to reorganize the workdays to adopt to other's schedules. In such cases, confusion can arise, and could be difficult for the team members to discuss and clarify the task-related issues.

Virtual teams rely heavily on IT and have little face-to-face interaction thus lack of nonverbal communication leads to poor communication. Face-to face communication represents 80 to 93 percent of the meaning that people receive while speaking (Velikodnaya, 2018). Unfortunately, virtual team members cannot see nonverbal clues. In addition to this, cultural differences can lead to conflicts. Virtual teams need to build relationships and get to know each other. Without a shared workspace, it is difficult to share complex information. Information technology is improving but still, it is not the perfect solution. Another challenge is the time zone differences which leads to exclude team members from virtual meetings and leads to misunderstandings as well. Moreover, the size of the team is very important because the big team needs to be well managed. If the team misses the goals and management, a lack of clear goals will affect the team performance. Because it is tough to communicate with the team members who are

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geographically distributed and keep them informed can be a big problem. Finally, team members need to understand their roles, whom they report to, and who reports to them. A poorly designed liability will have a negative impact on virtual teams and tasks. Also, there should be a leader in the team who sets clear goals and help to overcome challenges and makes sure that each team member is participating in teamwork (Velikodnaya, 2018).

On the other hand, the virtual environment has major advantages. In a virtual environment, team members are in different locations and associated with different business units and reporting to a different manager and this diversity can be highly valuable for teams. Because this provides heterogeneous sources of work experience, feedback, and networking opportunities for team members and organizations as well (Siebdrat et al., 2009). Organizations benefit from virtual teams through the ability for increasing cost efficiency, combining diverse talent, facilitating local knowledge, and parallel participation in asynchronous processes. However, these benefits are efficient only when teams are developed in an adequate way. As opposed to traditional working groups, virtual team members are faced unprecedented types of working environments (Zilli, 2016) and their implementation is at risk if organizations fail to address the challenges. Challenges (Figure 1) are caused by distance, time zone, language difference, cultural differences, adoption and implementation of technology, lack of trust and shared understanding among the team members and organizations (Pinjani and Palvia, 2013).



Figure 1 Challenges in Virtual Teams (adapted from Pinjani and Palvia, 2013)

3.2 Major Six Challenges Working with Virtual Teams

Virtuality has been specified as a multidimensional construct. Virtual project teams may cross several boundaries (Hoegl et al., 2010). From different studies, six major challenges of virtual teams have been identified: distance, time difference, technology, cultural difference, trust, and leadership. In virtual teams, distance, time difference, technology is not sufficient for high performance. In addition to these elements, trust and leadership capability are the real building blocks to high performance in virtual teams thus, collaboration depends on trust which improves task coordination among team members and leads to an effective collaboration (Alsharo, 2013). Figure 2 represents the path to high performance in virtual teams.

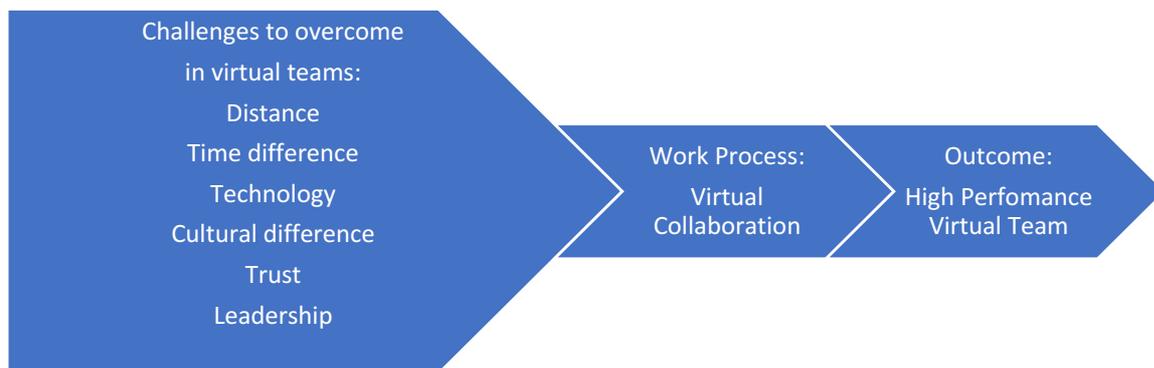


Figure 2. The path to high performance in virtual teams (adapted/updated from Beyerlein et al., 2008).

3.2.1 Distance

Distance imposes limits on face-to-face interaction, which is important for building trust, monitoring performance, and understanding cultural differences. Virtual teams do not share a physical workspace thus, the main challenge is team identification. Team identification pulls employees together, reduces stress, and is linked to employees' feelings of trust (van Dick et al., 2021). It is much more challenging to build trust when working in different places. Therefore, team members must be more disciplined about keeping in touch and sharing information with the rest of the team (Knoll, 2001).

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3.2.2 Time

Time differences can create advantages and disadvantages in virtual teams. It is challenging to schedule meetings and coordinate the globally dispersed team. However, a twenty-four-hour workday may be created (Kimble et al., 2000).

3.2.3 Technology

The majority of virtual team communication is carried out with technology. Employees must learn the technology before they start collaboration. There is also another challenge, when and how to use different types of technology for different purposes (Wang, 2001). Technology incompatibilities can also bring security and trust problems as well (Rowe, 2001).

3.2.4 Culture

Culture is a complex component that has several levels which are international, national, regional, business, and organizational. Moreover, there may be differences in management styles across cultures and nations (Beyerlein et al., 2008). Culture is one of the most important boundaries for virtual teams. It can affect people's assumptions, behaviors, expectations, and work habits (Duarte and Snyder, 2006). People from different countries and cultures have their own view. Therefore, awareness of different cultures has a great importance while building trust in virtual environments (Rosa, 2013).

In virtual teams, group member often has different cultural backgrounds. Cultural diversity poses both opportunities and disadvantages to virtual teamwork. Opportunities include creative approaches, innovative solutions, increased effectiveness. On the other hand, potential risks are linguistic and cultural misunderstandings, sensitivity in getting feedback and conflicts in the utilization of knowledge. Thus, organizations need to understand cultural diversity and should support relationship building and enhancing intercultural competencies for reducing the risks (Zilli, 2016).

3.2.5 Leadership

In virtual teams, leadership is a process rather than a position and it is shared a collaborative work structure. Virtual team leaders need to encourage two-way communication (Romig, 2003). Leadership behaviors like information use in problem-solving, trust-building, coaching become more difficult to perform as team members are physically remote and culturally diverse, and communication is electronically mediated (Gibson and Gibbs, 2006). Thus, specific leadership behaviors are needed (Kayworth and Leidner, 2002; Yoo and Alavi, 2004).

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Although there is no best way to lead a virtual team, virtual team leaders should have these features;

- Develop organizational context,
- Build teams,
- Support development,
- Provide resources,
- Set goals,
- Coach others,
- Lead performance management,
- Communicate with team members (Beyerlein and Harris, 2004).

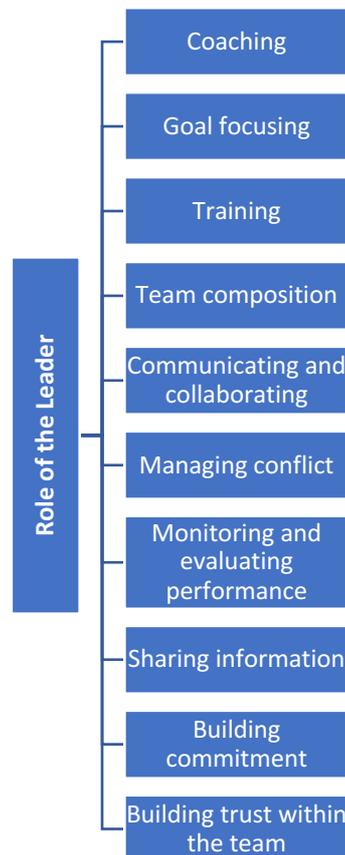


Figure 3. Virtual team leaders' role in the process of self-organization (adapted from Prystupa-Rządca and Latusek-Jurczak, 2014)

Leaders fulfill several key roles, such as motivating people, coordinating efforts and developing potential (Hambley et al., 2007). Goal setting is a good way to motivate a team. Goal setting is very important in both face-to-face and virtual teams. Virtual team members can be involved in multiple projects and multiple teams thus, they need to balance and prioritize the tasks.

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Therefore, goal setting becomes more critical within the virtual teams (Konradt et al., 2003). Additionally, providing feedback is important for motivation and goal setting. This allows team members to adjust their behaviors to achieve the goals. Therefore, virtual team leaders need to schedule periodic meetings with team members to provide feedback (Hambley et al., 2007).

Virtual team leaders operate in different conditions than leaders of traditional teams. In virtual teams, the team leader needs to use technology, should have cross-cultural management skills, the ability to coach distant team members, and the ability to build trust among dispersed team members (Fisher and Fisher, 2001). There is not just one type of virtual team describing the best approach for effective virtual team leadership. Leadership is recognized as a key factor in team effectiveness. But little has been done to explore what effective leadership looks like in a virtual team. There might be different virtual teams, for example, there may be groups that meet sometimes face to face, but other times virtually. Also, there may be groups that have never met face to face and only interact virtually. The leadership in virtual teams must serve two functions, team task management and team development (Eubanks, et al., 2016). Virtual team leaders are an interface between the team and their organization; therefore, they play a key role in the team's success. Leaders should overcome several challenges in virtual environments to motivate team members and they can provide effective solutions by:

- Using rich communication technologies such as video conferencing to inspire motivation.
- Providing feedback regularly to each team member.
- Exploring creative ways to provide feedback.
- Building team identity, meeting face-to-face with the team, and supporting the team to overcome the obstacles (Hambley et al., 2007).

The leadership role is less about direct supervision more about supervision to workgroups. Virtual team leaders are key facilitators for developing trust in work processes, being transparent and open communication in addressing positive/negative developments in terms of personality for team members. As a consequence, virtual team leaders do not control others, they coach individuals on how to control themselves (Zilli, 2016). When a group is closely collocated, a leader can more easily detect the problem in teamwork and resolve them by talking in an informal setting. Such an approach is not possible in a virtual environment. Geographic dispersion and cultural diversity make it difficult for a leader to ensure that the team is functioning effectively. Thus, virtual teams need to be aware of the difficulties and find effective ways to overcome the obstacles on their own (Siebdrat et al., 2009). In terms of

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communication competencies, leaders must be able to increase motivation, enhance trust when managing virtual meetings. Moreover, they need strong conflict management skills, the ability to hand over problem-solving. In this context, the virtual team leaders should always find the right balance between giving freedom and setting clear limits. Additionally, it is important to encourage the virtual team leaders to participate in personnel development measures in the area of sensitization in virtual cooperation and communication, leadership principles, leading without hierarchy, project management and remote management. Also, in virtual environments, people need to be more self-sufficient in managing their work and they should be able to develop the necessary skills to work in the virtual environment. On the other hand, team leaders should organize face-to-face meetings from time to time. Periodic face-to-face meetings of virtual teams can be effective for initiating and maintaining key social processes. Face-to-face meetings are important for improving informal communication and team identification. A project kick-off meeting can be used to bring everyone together in one location for several days, so people can develop a shared understanding of the task. These processes will support task collaboration during the project (Siebdrat et al., 2009 and Zilli, 2016).

3.2.6 Building Trust

Teamwork depends on trust. When team members are collocated, the trust may be easier to develop but in virtual teams, it is more difficult to develop. On the other hand, virtual teams depend on trust, but a person-based interaction or time spent together is very rare in virtual teams (Kimble et al., 2000). Communication is the key factor of trust (Alexander, 2000). Trust is related to the frequency and quality of communication (Nemiro, 2004). Moreover, trust is the positive and confident expectation of team members in one another (Pinjani and Palvia, 2013) and a key factor for addressing the challenges that can affect team effectiveness and success. But building trust among team members in a virtual team is not an easy task. Because in virtual teams it is not possible to observe physical behaviors while traditional face-to-face team members is reliant upon different behaviors and compensate for the lack of physically observed behaviors (Alsharo et al., 2017). Also, in a virtual environment, many teams come together for a short period of time to complete specific tasks (Powell et al., 2004). If trust can be built, it benefits the team, virtual meetings will have more robust participation and meetings will be more task related. High levels of trust between team members usually provide improved team communication and project. Trust may improve social communication amongst group members. Trust and team performance are positively correlated with effective communication among team members and organizations (Pinjani and Palvia, 2013). Sometimes it can be

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difficult to build a strong trust between companies and team members. Therefore, companies must provide adequate connections for their employees to be productive members of the virtual team (Rosa, 2013).

3.3 Common Virtual Team Challenges

In the previous section, major challenges are identified. In this section, common challenges are identified for virtual teams that are important to understand in order to be successful. Below is an insight into the common virtual team challenges and their management.

3.3.1 Communication Modalities

Virtual team interactions are almost supported by computer-mediated communication technology which brings challenges as well. Virtual teams have to deal with language barriers, cultural differences and some other specific problems in communication. Computer-mediated communication has numerous benefits like time flexibility, exchanging information efficiently, the ability to overcome long distances, better documentation of discussions, improved decision making and emotional distance in conflicts. However, these advantages are effective if computer-mediated communication is utilized in an appropriate way. Additionally, creating clear rules, expectations, and structures, planning predictively considering an appropriate timing is important for communication between virtual groups (Zilli, 2016).

Traditionally, the most common communication modality is face-to-face communication. But nowadays, the use of computer-driven communication has increased significantly. In general, computer-mediated communication is found less desirable for tasks that deal with complex problems because teams tend to take longer to complete a complex creative task. Researches show that teams are more likely to find creative solutions to complex problems through more personal and synchronous modes of communication. Alternatively, teams are more likely to find creative solutions to less complex problems through computer-driven communication. As a result, teams have the ability to move between various modes of communication whenever necessary can be the most creative (Kratzer, et al., 2005).

Organizations implement teams across a diverse range of fields to remain competitive for the completion of complex and non-routine tasks (Marlow et al., 2017). If the team is managed properly, teams could contribute competitive advantage. Communication is a team process that is identified as enhancing team performance. In a knowledge-based view of the firm, knowledge is seen as an organizational asset that can be used to create a competitive advantage for organizations. As knowledge is distributed among organizations and teams, the use of teams

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can facilitate the sharing of knowledge to improve performance and outcomes (Alsharo et al., 2017).

3.3.2 Team member proximity

The effect of proximity is that collaborators have the opportunity to contact each other. This provides assessing interpersonal compatibility and identifying common interests. In addition to this, proximity supports trust. Team members feel comfortable and can ask questions of others if they trust each other. Therefore, proximity supports creative performance. But the effects of proximity on team creativity performance are still argued. These arguments are divided into two parts: The first argument is that proximity decreases team creativity performance. Because distracted team members are likely to distract other team members thus, this decreases the team's creative performance as well. The second argument is proximity and high degrees of interaction may carry the momentum to the teams of their enthusiasm rather than by understanding of its real value. This may decrease the quality of critical thinking thus the quality of problem solutions can reduce (Kratzer, et al., 2005).

3.3.3 Group Dynamics

Collaboration needs to be established systematically and group dynamics need to be analyzed and understood for team development. Group dynamics are part of group development. Because of geographical, time and organizational distance group identification take longer to be developed. Both positive and negative forces can be identified for shaping virtual group development. For instance, shared goals and procedures, a balanced and effective agenda and effective use of technology may facilitate complexities and provide a constructive environment for collaboration. In contrast, virtual group dynamics may be impeded by members' absence, difficulty in accessing information, poor management of meetings, nonparticipation and technology problems. Also, virtual team dynamics are affected by time, environment and the team's composition (Duarte and Snyder, 2001). Consequently, building relationship in virtual teams requires a higher level of attention than in traditional teams. Therefore, informal communication channels, incentives for extraordinary performance, trust while creating a group culture and motivation needs to be actively supported in virtual teams and differentials should be minimized through team-building techniques. Also, teams should maximize the use of technology with participation and decision-making. Virtual teams should be well planned from the beginning regarding the group dynamics (Zilli, 2016).

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3.3.4 Conflicts

It is not surprise that team conflict is a problem in virtual teams. Still, it is not a clear understanding of how a virtual team leader can manage conflict (Mortensen and Hinds, 2001, Hinds and Mortensen, 2005). In a virtual environment conflicts can arise quickly from misunderstandings because of restricted communication. The three types of conflicts have a significant effect on virtual team performance. Different types of conflicts can be identified that have an influence on team performance: 1) task conflicts referring to work content and assignment of activities: task conflicts arise when the activities are not fully understood or shared by a team member. The result could be disagreements among project members about tasks or work content. 2) process conflicts dealing with disagreements on methods and processes: process conflicts arise when project members disagree on the methods to complete tasks. 3) relational conflicts including negative emotions and interpersonal disagreements: relational conflicts arise between team members not directly related to the tasks. Conflicts should not be understood as negative because task and process conflicts may stimulate innovative solutions and developments. Virtual teams have to deal with a higher risk of conflicts and misunderstandings due to restrictions in communication compared to traditional teams. Dealing with conflicts in virtual teams requires a higher sensitivity and handling disagreements in a constructive way, explicit methods of problem-solving and conflict management when compared to traditional methods (Zilli, 2016). Consequently, detection and management of conflict can be managed better with effective leaders (Hinds and Bailey, 2003).

3.3.5 Virtual Team Development

Complexity is rising globally; thus, companies require talented and multi-disciplinary teams for new market challenges. Virtual teams combine talent across organizational, geographical and time boundaries. As mentioned in the previous section, working in virtual environments compared to traditional workgroups, poses challenges to team members. Since virtual teams vary in infrastructure, distribution, there is no definite approach for developing the team. However, there are some key factors for virtual team development during their self-organization process (Zilli, 2016).

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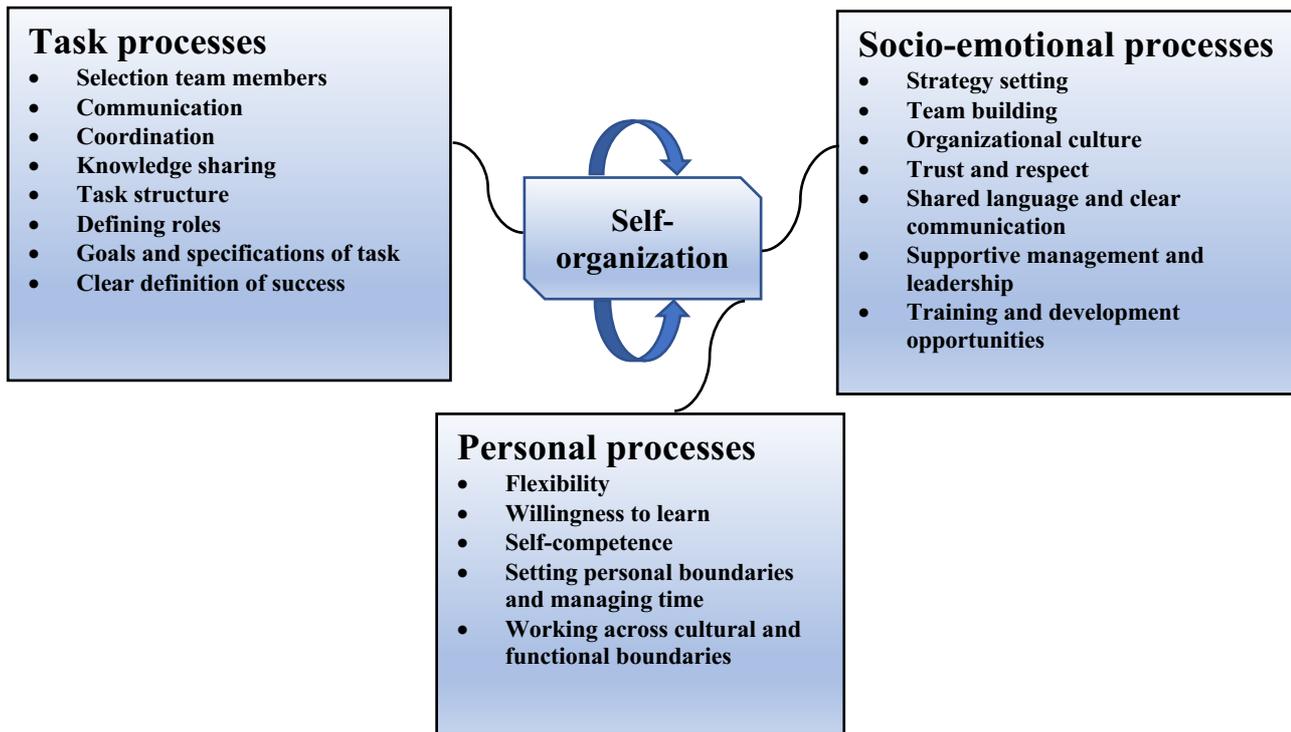


Figure 4. Virtual team relationships between key factors (adapted from Lin et al., 2008)

3.3.6 Team Performance

Teamwork is a set of skills that should be developed. There should be a leader in the team who sets clear goals, help the team to overcome challenges, and makes sure that technology is working, and each team member is equally participating in the teamwork.

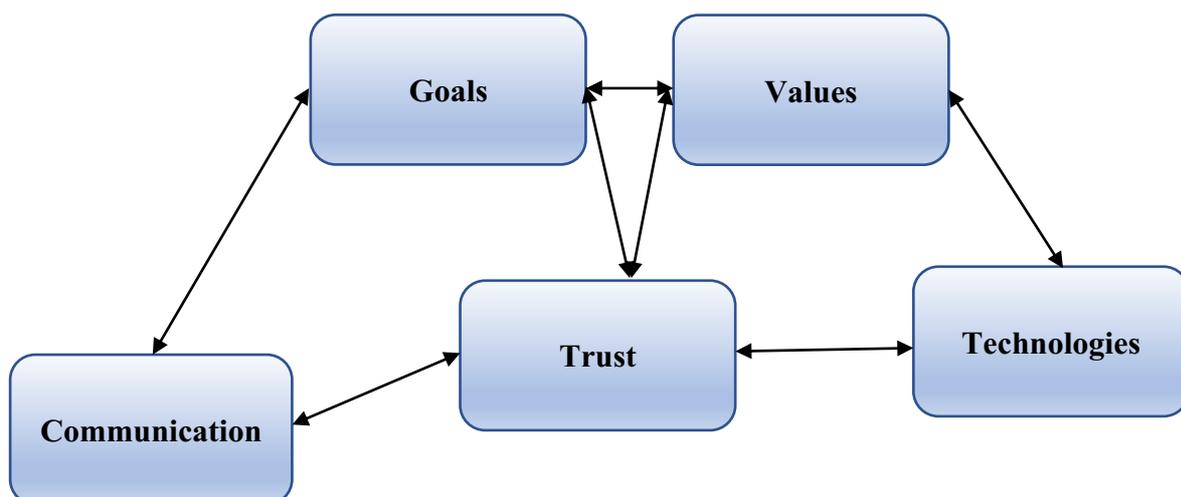


Figure 5. Concept of virtual team performance (adapted from Velikodnaya, 2018)

There should be common goals and values established and well described in virtual teams. Technology should allow each team member to be a part of the process. That should include

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everyday communication, such as e-mails, phone calls, teleconferences, and hangout meetings. Also, there should be a virtual workspace that would be reachable for all team members such as google drive. There should be free and clear communication between team members and managers as well. In this concept communication and technology support each other which affects the team performance in a positive way (Velikodnaya, 2018).

3.3.7 Task Interdependence

Task interdependence can be defined as the degree to completing a task that requires interaction between team members. Task interdependence has a significant effect on team processes and outcomes which moderates the relationship between team diversity and team performance by influencing team member interaction and coordination (Pinjani and Palvia, 2013). Virtual team members may feel that their personal contribution to the project is not really crucial for the team's success. This is one of the main reasons for motivation losses in virtual teams. When task interdependence is high and one's own performance is poor, that would affect other team members' work as well. Thus, in such cases, team members should feel that their personal contribution is necessary for the team's success. This should increase the motivation of the team member and thus, leads to higher team effectiveness (Hertel et al., 2004).

3.3.8 Task Disagreement

Generally, task disagreement tends to be related to positive team outcomes whereas relationship conflict negatively affects the teams and the team members. However, task disagreements may affect a relationship if they are taken personally by team members. Furthermore, if task disagreements are not solved, they may turn into relationship conflict. In such cases, team members spend more time and energy focusing on each other rather than on the task. As a result, team efficiency can be hindered, and project success can be damaged as well. To prevent such outcomes, it is important to understand each other in the team and the conditions of the task (Moreno et al., 2012).

3.3.9 Knowledge Sharing

Knowledge is seen as an organizational asset that can be used to create a competitive advantage for organizations and individuals. Nearly every virtual team is focused on effective knowledge sharing. Because virtual teams face more extreme challenges regarding knowledge sharing. An effective team process is needed which allows appropriate expertise and knowledge to be shared with the other team members (Beyerlein et al., 2008). Knowledge is distributed among organizational employees and individuals to improve performance and outcomes. In virtual

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teams' people can utilize others' knowledge and develop their knowledge as well. Knowledge sharing provides better task performance. Efficient knowledge sharing has a positive impact on the success of the team's project (Pinjani and Palvia, 2013). However, knowledge sharing is dependent on the voluntariness of individual team members. Alsharo and his teams' research shows that knowledge sharing is crucial for virtual team collaboration because knowledge sharing positively influences trust and collaboration among virtual team members. Also, to collaborate effectively in virtual teams, team members must build open communication and effectively share the knowledge with each other (Alsharo et al., 2017).

3.3.10 Training

Virtual teams usually require support to achieve their goal (Baan and Maznevski, 2008). Learning the technology is not enough, a valuable training is a key aspect for virtual teams while building the team. In some organizations, people may have learned to work virtually on their own (Baan and Maznevski, 2008). That's why the training should include self-managing skills, communication training, project management skills, and technology training (Bal and Teo, 2001). Although they learn how to collaborate virtually on their own, some of them cannot explain what they did in a systematic way. Thus, designing a virtual collaboration development program is crucial for remote teams. The training program should be designed by creating materials and training facilitators. The program can be integrated into the organization's leadership and staff development programs (Baan and Maznevski, 2008). Analyzing training needs for participants involves a set of skills and knowledge in virtual team settings. Of course, not all participants require training in all of the areas, but they should be able to use the collaborative technology and they need the ability to collaborate effectively by using virtual methods. Before training needs are assessed, there has to be agreement at the organizational level on what work needs to be done. Once the organizational needs analysis is finished and training is recommended for virtual teams, the next step is training. The training needs analyst who can be a training specialist in the organization or can be a manager, supervisor, or team leader. A specific framework is used for training. Frameworks usually include examination of the training needs at the organizational level, work unit, and individual level (Cascio, 2005).

In virtual collaboration settings, how the work will be done is significant. Five major areas of proficiency need attention for successful virtual collaboration:

- Organizational knowledge
- Cross-cultural knowledge

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- Work content and subject matter expertise
- Collaborative technology skills and knowledge
- Collaborative work process skills and knowledge

Knowledge and understanding of the organization and cross-cultural issues are necessary before virtual collaborations begin. The work content of the virtual collaboration requires team members with particular expertise. Then the team members should be able to use the technology and they should be able to collaborate effectively using virtual methods with the help of training. In summary, training will provide a complete view of learner needs and assist training professionals in design and delivery decisions. These decisions can make virtual collaboration successful in an organization (Wesner, 2008), and a good virtual collaboration training program improves the organization's performance (Baan and Maznevski, 2008).

3.3.11 Security

Security is a very important issue for virtual teams. Because virtual team working involve the exchange of sensitive information and data through the internet (Bal and Teo, 2001). Therefore, a special security level needs to be identified for virtual teams (Hunsaker and Hunsaker, 2008).

3.3.12 Collaboration

By using new technologies, companies find ways for people to work together on a common goal. Knowledge of virtual communication tools like e-mail, online chat, web conferencing is becoming necessary for workers. Therefore, the meaning of collaboration is referred to as virtual collaboration. Virtual collaboration occurs when people are geographically distributed and use communication technologies to work together to get the work done. Virtual teams consist of a group of people who work in different places and in different time zones. Virtual teams are typically a project or task-focused groups, team members may change on a regular basis (Nemiro, 2004). Collaboration is a significant part of virtual teamwork and an effective collaboration leads to an effective outcome. Virtual team members are chosen for their knowledge and expertise. However, this does not guarantee effective collaboration. Therefore, virtual teams need to establish open communication and organize activities among each other (Hemetsberger and Reinhardt, 2009 & Alsharo, 2013). If virtual team members cannot coordinate their tasks properly it is possible to face serious impediments which impact collaboration. Team members shall overcome the challenges in virtual organizations by keeping open communication, coordinating activities properly, and collaborating effectively (Durate and Snyder, 2006). Consequently, virtual collaboration requires patience, experience, and

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learning. Organizations need to recognize the importance of supporting the team. Effective communication and providing training help establish trust, shared understanding between team members thus, effective virtual collaboration can be achieved (Peters and Manz, 2008).

3.3.13 Coordination

Assigning tasks and deadlines to team members is an effective way of achieving goals. This can be relevant for virtual teams because virtual teams are slower at the beginning of the projects (Walther and Bunz, 2005). Additionally, weekly team meetings are a good coordination mechanism. Team leaders should make team members aware that sharing knowledge is beneficial and the discussion should stay focused on the issue instead of becoming personal conflict. Leaders should also emphasize team identity to reach the team's goals. On the other hand, less socially confident people may hide, therefore, leaders should encourage team members to be part of the discussion (Hambley et al., 2007). Several collaboration tools are available for the coordination of virtual teams such as instant messaging, video conferences, data-sharing applications, and collaborative space. These tools are important for virtual team functioning but can also be a barrier if they are not used effectively (Bajwa et al., 2005). As a summary, different strategies can support coordination in virtual environments:

- Using clean communication methods to support team members working with each other and being familiar with their tasks.
- Planning weekly team meetings to update team members.
- Establishing tasks and deadlines early.
- Facilitating the development of the relationship between team members.
- Choosing familiar coordination technologies for the team to feel comfortable while using it.

These norms keep teams coordinated toward reaching their common goals. Thus, in virtual teams, communication technology and the right experience is critical for effective coordination and collaboration (Bell and Kozlowski, 2002).

3.4 Summary

Virtual teams have many benefits to companies, but also have many challenges and potential difficulties. Virtual teams are very common nowadays with many fascinating opportunities and due to these opportunities, virtual teams are becoming popular in organizations (Ebrahim et al., 2009). In virtual environments, a team should have common goals and values from the

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beginning. Each team member should understand clearly his/her role. Additionally, it is very important to have the right technology to support team communication. Basic computer-mediated communications are available, and teams should decide the most appropriate technology for their project and process. On the other hand, computer-mediated communication is not always desirable. Teams may benefit from face-to-face discussion at the beginning of the project or at least once a year during the project period. For instance, some activities, such as workshops, conferences, and standard review meetings can be performed better with face-to-face interaction. The specific needs of the team should adopt tools and the team should try different technologies and online working spaces to choose the best one. Clear appreciation and motivation should be established to encourage team members from the management and manager of the virtual team should overcome the managing conflict, cultural and language problems, and mistrust among the team members. Team leaders and team members should be sensitive to cultural differences. Cultural differences can be an advantage if they are used in a positive way (Velikodnaya, 2018). As a result, in virtual teams, collaboration requires trust, shared understanding, and strong relationships between team members. In order to build trust, team members need to promise each other and meet the deadlines of the tasks. Moreover, team leaders should build and maintain trust between the team members. They should be flexible and develop organizational processes to meet the demands of the team. Also, team leaders should use electronic communication technologies appropriately and they should have experience leading in a cross-cultural environment. For shared understanding, team members should be aware of the common goals of the project. Further, virtual team members should feel comfortable while communicating with each other. Open communication can be an effective way of building trust, developing a shared understanding, and forming a strong relationship between team members. Better relationships among team members will help resolve conflicts and increase effective collaboration (Kirkman et al., 2004).

3.5 Communication and Systematic Design Approach in Virtual Teams

There is a need for knowledge on how communication affects performance in order to benefit from the collaboration within and between the teams with experts from different organizations. Teams need to solve complex problems together on time and within budget so that the entire project, can perform well (Hoegl and Weinkauff, 2005). Team members and teams have to communicate successfully in order to work on a complex task within time and budget restrictions. Team members are assigned to specific tasks based on their expertise that needs to be combined into new knowledge in order to solve complex problems. Certain types of

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communication may be beneficial to solve the problems and performance may be positively associated with the communication. Since the complexity of the tasks is increasing, a greater need for information technology and problem-solving communication is crucial in virtual teams. Complex problem-solving situations require a specific solution and a set of possible alternatives. Therefore, high interactions within and between teams are needed. Sharing internal and external information helps teams and team members to understand the process more quickly which improves the performance. In order to solve complex problems effectively diverse expertise has to be brought together in a coherent way. Thus, effective communication is required for providing the necessary information to the right people at the right time (Kratzer, 2001).

3.6 Communication Principles for Problem Solving in Virtual Teams

Virtual teams are useful in creating new complex products where teams of experts are needed to achieve the common goal in time for the market (Hoegl et al., 2004). Communication is positively linked to team performance and contributes to team effectiveness and it is significant to overall project performance (Mell et al., 2014; O`Sullivan, 2003). In different studies, communication is considered as the process of developing and sending messages and creating sharing definition (Keyton et al., 2012). While communication relates to project outcomes, managers or team leaders have to decide difficult decisions about having to achieve time, cost, and quality (Schwalbe, 2010).

Research on project management points out that leaders require different skill sets across the planning and implementation phases of projects. Organizational and technical skills are important during project planning and managerial leadership and team members` skills are very important during implementation. Certain stages of a project require input from many people, while other stages require coordination and management of ideas (Eubanks, et al., 2016). That`s why it is important that managers should know how problem-solving skills and communication influences team and project performance. When project managers or team leaders are focused on one objective or many, decision-making can be challenging. For instance, project managers or team leaders may prioritize the tasks for the shortest processing time. Thus, different types of communication plans are needed to address time, cost, and quality objectives during project management. On the other hand, if more capacity is needed during the project, the team member should utilize multiple media options, direct asynchronous and direct synchronous until fulfilling the demand. For such cases, the team manager or team leader may mediate communication in order to keep employees focused on the task. Therefore, the project manager

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or team leader should understand the project details to achieve time goals and select the best route and most efficient way for the time being (Kennedy et al., 2017).

Studies showed that complex tasks increase the need for coordination because of the uncertainty of the outcomes (Bell and Kozlowski, 2002). Asynchronous or synchronous communication options are important for coordinating team members in different time zones (Binder, 2007; Evaristo et al., 2004). In order to meet quality objectives, direct synchronous communication is the key factor for all levels of the project. But if the project has a high complexity, direct asynchronous and synchronous communication is involved to provide the best quality for the project. As a consequence, when maximizing quality, communication plans can address increasing project complexity by changing behavioral patterns (Kennedy et al., 2017).

3.7 Design Principles for Solution Finding in Virtual Teams

Virtual collaboration sets up the conditions for more effective collaboration. The nature of the virtual environment requires more thought and design specificity than face-to-face work. If virtual collaboration is designed and led well, success is the inevitable outcome. Virtual teams have the best chance of success in such cases:

- If the consequences are clear (e.g., collaborating well or not collaborating).
- If organizational success also matters to individuals.
- The results are depending on collaboration.
- The virtual environment conditions are sufficient for team members to raise their creativity and performance.
- Leaders have the skills to be effective in managing the virtual collaborative work situation.

As a consequence, if purposeful design, led by skilled leaders this can reshape behaviors and unleash the win spirit of team members in the virtual work environment (Beyerlein et al., 2008).

3.8 Design Principles in Virtual Teams

Design process principles for virtual teams have been introduced in the literature (Harwood and Beyerlein et al., 2008). In this section, why the principles are important and how to design for success will be defined in detail.

Select and position leaders for success: Effective leadership is the key factor to all aspects of designing and managing virtual collaborative work. Leaders must teach, coach, and encourage

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collaboration because communication is the critical qualification for leaders in a virtual environment. In order to be successful, leaders should be curious learners, relationship-focused, experienced, emotionally intelligent, process and result-focused, able to give constructive feedback, and good communicators and listeners. These elements should be considered in the leader selection process. Because these implications in the design process is essential to position leaders and teams for success (Harwood and Beyerlein et al., 2008).

Engage all in a common purpose: Engaging people to become part of the vision is essential in the design process. Because it is not possible to set up a work process if the purpose is unclear. To contribute to work, the first need is the context. Leaders should help and encourage people in the vision and purpose of the task. Leaders can also create the context by answering some questions, e.g., who our competitors are, how do we compare, what are our customer requirements, what will we deliver, what is our strategy, when we are successful and what will that mean, how would we describe our vision and purpose, etc. When the leader explores the context, everyone should be involved and create shared ownership for the success of the project (Harwood and Beyerlein et al., 2008).

Create the content for understanding: It is important to build understanding between teamwork and its impact. Therefore, inviting customers or partners to address and describe their business challenges is very important. Furthermore, observing a customer operation using a checklist to record observations would be helpful for the project's success (Towers Perrin, 2004).

Create a universal language in operating principles: Clear expectations are essential for good organizational functioning in virtual teams. To involve team members in the creation of operating principles, these steps are important (adapted from Brooke, 1984).

- A sample of the design principles should be given to the people.
- Tasks should be assigned to the groups. Groups should take time to brainstorming and draft operating principles.
- Giving feedback to drafts and adding suggestions is essential.

Document reliable work processes: Creating a work process is the key factor of the design. Documenting processes are also important to facilitate the review of results to identify the process improvement (Beyerlein et al., 2008).

Establish roles for decision making: Identifying roles and responsibilities in decision making is important in work design and especially in virtual teams (Beyerlein et al., 2008).

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Create goals and measures accessible to all: Creating goals is an essential factor for effective virtual organizations (Bennis, 2000). Identifying measures that can be easily accessed is also crucial. The leader should manage the team in order to define how success will be measured, the frame for the goal, stages, challenges, etc. (Covey, 2004).

Set up mechanisms for feedback: Connecting people across units, time zones and cultures is essential in a virtual environment. Working in a virtual environment requires a review both within the team and across the larger teams. Review can be facilitated by a checklist or scorecard that contains tasks and activities. Furthermore, team leaders should give positive feedback to negative or constructive feedback to the teams (Braksick, 2007).

Create a plan: Working with a design team is important but people and teams beyond the design team can be involved in creating work processes and the whole system can be set up for success. In the beginning, good stakeholder analysis will ensure all relevant parties are included. Leaders should support team members to educate and support their peers. Designing the communication and education process should involve leaders and design team members and also people who have not been directly involved in the design process. Consequently, holding work sessions that are interactive and involve people from teams is essential (Beyerlein et al., 2008).

Design for sustainability: Design for a successful virtual environment should be dynamic. To be successful in a virtual environment, the design must be aligned with other corporate systems. Virtual collaboration design typically relies on technology for connection. Thus, periodic checks will provide that the design is working optimally and will enable participants to make corrections if needed (Beyerlein et al., 2008).

Modern organizations are becoming virtual work systems composed of distributed collaborative teams and complex concepts that support the design of an effective virtual environment. Virtual teams must be supported by effective technologies that allow collaboration among team members. Team tasks must be divided in order to provide independence and allow team members to know their responsibility. Assigning tasks in such a way ensures that team members can share information and knowledge. Using a variety of modes of communication provides team members to collaborate effectively. As virtual work systems improve, organizations require greater collaboration among teams and team members. Therefore, particular attention must be considered in virtual work systems in terms of the structure and process of the teams and the technologies used for effective and efficient collaboration among all participants (Obradovich and Smith, 2008).

3.9 Influence on Team Communication

With a systematic design approach, the complex projects, the information flow within and between teams can be structured and managed. The problem-solving activity, hence, communication, should mainly take place within teams where team members are jointly solving the assigned tasks with their expertise. When team members work in a systematic way, they can overcome the task complexity and if they communicate accordingly it contributes to team performance and overall project success. Problem solving communication within and between teams is important and needs to be managed (Marlow et al., 2017). Their relation is presented in the model in the Figure 6.

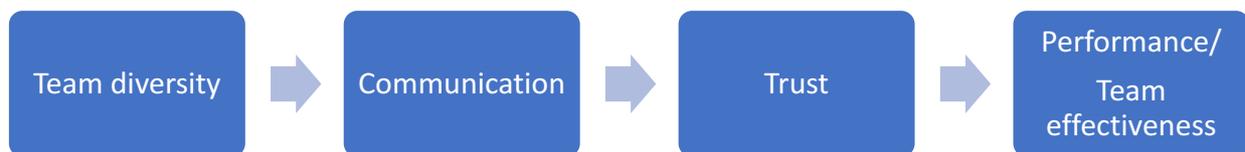


Figure 6. Proposed communication process in virtual teams (adapted from Marlow et al., 2017)

The proposed communication process is describing communication as a team process. According to Purvanova's (2014), research findings, virtual teams communicated less frequently, shared less knowledge and thus the performance decreased as compared to face-to-face teams. Additionally, researchers think that team communication can be conceptualized as the exchange of knowledge or messages between team members. Consequently, communication is recognized as a team process because it enables the development of team performance and coordination (Marlow et al., 2017). In this section, process elements will be discussed that are most necessary for achieving targeted outcomes and particular relevance to the virtual teams.

3.9.1 Team Diversity

Team diversity has defined all kinds of differences and similarities, whether visible such as age and gender or characteristics that may not be seen such as beliefs. Different studies have been done and significant progress has been made that team diversity may impact performance. For

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instance, regarding Harrison and his colleagues' (2002) research, diversity mediated the relationship between team diversity and team effectiveness (Harrison et al., 2002). Because variations in terms of culture, language, knowledge, and backgrounds are associated with a lack of understanding which may negatively affect performance (Van Knippenberg and Schippers, 2007). In contrast, team diversity may facilitate a high level of performance if high-quality communication occurs between team members. Because understanding and integrating team members' perspectives can provide valuable insight for achieving a high level of performance. However, if communication quality is low, team members may suffer from coordinating with team members due to the lack of understanding of each other and the task. As a consequence, within face-to-face teams, communication quality fully mediates the relationship between team diversity and team performance but in virtual teams, this relationship is partially mediated by communication quality (Marlow et al., 2017).

3.9.2 Trust

Within virtual teams, trust can be defined as the degree of reliance. Virtual team's trust has three dimensions, i.e., personal-based, institutional-based, and cognitive-based trust. Personal-based trust develops during childhood and has a lasting effect that can be seen in an individual's everyday life. Institutional-based trust is crucial for virtual team effectiveness because teams need people who are self-monitoring. Cognitive-based trust is based on one's interaction with another and it is the most beneficial trust for team effectiveness (Thomas, 2014), and Kanawattanachai and Yoo's (2007) study showed that cognitive trust is related to virtual team performance.

3.9.3 Team Effectiveness

Teams are the main component of the organizational structure. They enable organizations to reach more effective outcomes (Cogliser et al., 2012). In virtual teams, it can be difficult to manage the team and it could take longer to reach an effective outcome. Team performance is measured by evaluating the team outcome and comparing it to the requirements of the task. Team members need to feel belonging to the team because this provides satisfaction from the team functions and if the team members are satisfied, the result will be an effective outcome (Alsharo, 2013). Understanding the effectiveness of the teams is significant in the business world because they are expected to facilitate increasing organizations' efficiency. Cohesion is a key factor of work teams' effectiveness. Cohesion reflects encouraging group members to stick together (Auzoult, 2013). From a broader perspective, cohesion refers to the quality of individual interactions because sharing common values put forward work teams' effectiveness.

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Regarding Auzoult's study, reduction of perceptual power distances between team member and their team leader will increase the task cohesion and team's effectiveness (Auzoult, 2013).

3.10 Summary

Virtual collaboration requires skillful leaders and inspired design work. The executed well design processes can overcome the impediments to creating new and better ways than traditional organizations. The principles are defined in this section and the result is that good design enables people to be successful (Beyerlein et al., 2008). Principles that are discussed in the literature are summarized as follows.

Select and position leaders for success:

- Identify key competencies and design a comprehensive selection process.
- Remove barriers and support the design process with executive leadership.

Engage all in a common purpose:

- The landscape and the vision of the project should be described by executive leaders.
- It is important having fun while creating visions of the future.

Create the content for understanding:

- Listen to customers or suppliers to tell their stories.
- Research the competition to discover the advantage.

Create a global language in operating principles:

- Begin with samples or use cases and customer experiences.
- Use small groups to work with various aspects of operating principles.

Document reliable work processes:

- Work in small groups and focus on a specific sight of a work process.

Establish roles for decision making:

- Identify roles and responsibilities for activities and decisions.

Create goals and measured accessible to all:

- Create a common goal for the tasks.
- Identify the critical measures and define how they will be maintained and accessed by all members.

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Set up a mechanism for feedback:

- Agree on scorecards or other mechanisms.
- Create the process for review and continuous improvement and leader feedback.

Create a plan:

- Identify stakeholders who will be touched by design and support for understanding.

Design for sustainability:

- Create a plan to adjust the design for a virtual environment.
- Create a plan to check system effectiveness.

Principles that are discussed in the literature are also matched with the survey in this study. According to the principles in the literature and based on the responses from the survey in this research, it was found that trust is a significant factor for an effective virtual team process. Because trust can assist in increased performance, satisfaction, communication/collaboration, and decreased job stress. Additionally, job satisfaction increases the efficiency in virtual teams therefore, engaging all members in a common purpose, group cohesiveness, good content for understanding, and knowledge sharing are significant for virtual team settings. In addition to these factors, special opportunities should be given to virtual team members for their career development. Thus, skilled leaders should motivate the team, establish roles for decision making, create a sense of ownership of the project, set up mechanisms for feedback, and review the teams and project progress regularly. Consequently, high trust, team cohesion, and communication are the key factors for virtual teams to overcome the challenges (Gaudes et al., 2007). Virtual collaboration requires effective leadership and inspired design work. The principles outlined in this section and good design enable people to be successful in the system (Beyerlein et al., 2008). Different factors have been identified that influence how virtuality impacts team outcomes. Thus, it is necessary to consider all factors such as characteristics, to solve the complex virtual impacts on team communication and its relationship with relevant outcomes.

4 A Framework and Technology Point of View for Working Across Boundaries

A boundary is a condition that defines who is in and who is out. Boundaries separate the system from its surroundings, protect the team, require management, create a division between units, and represent limits of recognizable quantity, area, and scope. A boundary has been considered an organization design tool to keep members and nonmembers in or out in all levels and types of organizations. Members of virtual teams can identify the boundaries that may limit their progress. The following boundary conditions may hinder the attempts of virtual team members to collaborate on projects (Beyerlein et al., 2008):

Individual Boundaries:

- Discipline
- Identity
- Ethnic background
- Native language

Technical Boundaries:

- Differing technological systems
- Technical language

Geographic/Environmental Boundaries:

- Time (different time zones)
- Geography (distance)
- Country (restrictions in sharing technical knowledge with defense implications)
- Cultural difference

Task-related Boundaries:

- Task (different understanding of task)
- Skills (differing skill levels)
- Project (assignment to multiple projects)
- Resources (limited resources or support)

Organizational Boundaries:

- Cultural difference (differing company value systems)
- Departmental (differing local politics)
- Company (restrictions in sharing knowledge)
- Audit or authority (who is leading what?)
- Hierarchical (status differences)

4 A Framework and Technology Point of View for Working Across Boundaries

- Institutional (competitors, regulators)

Although this list is somewhat exhaustive, there is no optimal condition. Managing boundaries is a complex process. Sometimes boundaries lead to mistrust and conflict between team members and as a result, creativity and collaboration are missed. Therefore, the boundary should be managed in a way that promotes performance (Beyerlein et al., 2008).

4.1 Planning Collaborative Work Processes

The key characteristics of collaborative work design are teams depend on each other; they need to share knowledge freely and coordinate their efforts toward common goals. These factors affect the performance of the teams and the project. Collaborative structures include different types of teams such as temporary or permanent, single function or multifunctional, collocated or distributed. There is a variety of collaborative structures may be available in organizations. But the most important point is that the organization should support collaboration and the teams' current design should be discussed whether it is optimal for successful collaboration (Nemiro, 2004).

4.2 Continuous Knowledge Management Systems

Knowledge management is the process and support system that the virtual teams rely on. The value of knowledge increases with its wider accessibility and use, how frequently it is shared, and the degree of dissemination (Dirksen et al., 2005). Open sharing can add value to knowledge. However, knowledge sharing is difficult under time pressure, complexity and challenges on a daily basis. Knowledge management has emerged to manage these situations. Knowledge management provides the infrastructure to make both tacit and explicit knowledge readily available. Consequently, the virtual team should have the necessary resources and tools to ensure successful collaborative results in terms of expertise and knowledge, communication tools, time, and creative members. If these elements are not available, team members should consider actions that would lead to further improvement in knowledge management (Beyerlein et al., 2008).

4.3 Sustaining Support Systems

Team support systems provide infrastructure to support high levels of performance. Successful support managers need to pay attention to the support system and teams' needs. Leadership is a key support system in teams. In virtual teams, members often report to multiple leaders and managers, one for on-site work and one for virtual work (Beyerlein and Harris, 2004). Another

support system is the performance, and it can be managed in various ways. In virtual teams, the challenge is greater because the behaviors are typically invisible thus, extra attention should be paid to measure the performance. Furthermore, online training systems are convenient for virtual teams, but they are not the most effective systems. The learning systems include formal training, mentoring, coaching, workshops, and conferences. Learning is essential for creative knowledge work and developing the team's processes. Therefore, members need to be educated about the special needs of virtual teams. Other support systems, such as workspace and equipment are important for virtual teams. Because without adequate hardware and software team members cannot communicate and collaborate well, this causes handicaps to the team's process. Consequently, team members may check their relevant support systems that do or do not support collaboration. According to the results, team members can make discussions for actions to improve each support system with regard to virtual team collaboration (Beyerlein et al., 2008).

4.4 Virtual Team Member Roles and Competencies

In virtual teams, collaboration and coordination are more complex than collocated teams. Because time difference, distance, cultural difference, and organizational boundaries are a barrier for team members. Virtual team members should balance coordination and collaboration. Team members also should take the initiative in coordinating with other team members and organizations. Further, building trust with other team members and sharing learnings from the experiences are significant for effective collaboration. On the other hand, virtual team members need to behave autonomously for taking responsibility, clarifying tasks, addressing conflict between the team and other partners. Thus, virtual team members should have competencies such as project management, networking, the use of technology, self-management, boundary management, and interpersonal awareness (Duarte and Snyder, 2001).

Project management: Good project management techniques include carefully planning and scheduling work, reporting progress, reviewing plans, and providing early warning of problems and delays to the team leader, affected team members, and stakeholders.

Networking: Virtual team members need to be skilled in networking and in communicating with and without face-to-face contact.

The use of technology: Virtual team members need to develop their skills in using and selecting the right technology to communicate and collaborate. Team members who have technical backgrounds may be more experienced with technology however, all team members

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should increase their basic competencies and should be open using and learning new technologies.

Self-management: Team members should be skilled in establishing professional priorities, prioritizing work, taking the initiative to reach the goal of the project and tasks.

Boundary management: Virtual team members need to be sensitive in terms of differences in business in different parts of the world. Additionally, they should understand national and organizational cultures' impact on working styles, team interactions, expectations, and team dynamics.

Interpersonal awareness: Virtual team members should be aware of how others understand them and how their behavior affects the team's productivity (Duarte and Snyder, 2001).

Consequently, virtual team members need to have basic competencies and they should balance coordination, communication, and collaboration.

4.5 Emotional Cohesion in Virtual Teams

The capabilities of technology change the way of work processes and the management of organizations and teams. Nowadays, networks are the workplace and virtual work can go on from different locations and organizations. This gives agility to the organization to increase speed and quality. Moreover, if the virtual team has an emotional connection, the virtual team's productivity can increase. Because emotional bandwidth is the personal and sustainable connection among virtual team members who are working together for a common goal. Consequently, the technical and emotional bandwidth among members affects the quality of work being done. Thus, it is also important for virtual leaders to connect people interpersonally and organizationally, lead them to success, and support teams to widen the emotional bandwidth to increase the project quality (Hoefling, 2008).

4.6 Team Staffing Strategy in Virtual Teams

Team selection is a significant factor for differentiating successful teams. In virtual teams, the most suited people are involved in a particular project. Virtual team leaders need to be sure that the project is clearly defined, tasks are well established, and the team members with the necessary skills are selected (Hunsaker and Hunsaker, 2008). Staffing should focus on selecting a potential membership based on generic task skills and generic teamwork skills. The criterion for a successful team staffing strategy is building teams with the right expertise and the team members need to work together well. The team staffing strategy has four steps: 1) identify the skill requirements, 2) select potential candidates based on their skills, 3) identify the specific

task skills requirements, 4) determine the appropriate mix of members based on their specific skills. The team staffing strategy directly influences team performance. Because work processes are directly dependent on staffing decisions. Contextual mission and team variables such as team size and interdependency of tasks moderate specific task work skills and team level attributes. Project parameters influence staffing and decisions. After the parameters have been identified, the next step is identifying the specific and generic task work and teamwork competencies to consider team composition. The goal is to identify team members based on generic skills needed for team effectiveness. Generic teamwork skills refer to the capabilities to work effectively in any team environment regardless of the task (Indeed Editorial Team, 2021). Teamwork skills are the fundamental requirement for collaboration on team tasks. Different team members have different levels of different skills, but the whole team should possess all required task work skills. Consequently, a team staffing strategy is a significant requirement for virtual teams because they are composed with a focus on leveraging expertise across barriers of the time difference, space, and cultural difference. Therefore, when staffing teams, it is important to analyze the task for individual and team levels (Orvis and Zaccaro, 2008).

4.7 Virtual Team Meetings

In virtual environments, all participants need to share information, coordinate, collaborate, discuss, make decisions and produce output. In virtual meetings there are some significant points for the efficient meeting:

1. Selecting the appropriate technology, type of communication and defining the purpose of the meeting,
2. Scheduling the meeting according to the availability of the participants,
3. Develop an effective agenda and share it with the team members before the meeting.

The general rule is that virtual meetings use synchronous methods with rich communication channels with text and graphic capabilities. Real-time conference is the best option for discussing different methods and solving conflicts. In extreme cases, where issues are highly complex and when the team is newly formed and none of the technologies are appropriate, face-to-face meetings should be scheduled. Consequently, there are many practices that can make meetings more effective, and facilitating a virtual meeting needs well-prepared agenda, the participants, and the technology (Duarte and Snyder, 2001).

4.8 Problem Solving in Virtual Teams

The growing complexity of organizational and technical problems necessitates a team approach for solving problems. In virtual work environments, team members must work together to solve problems. Additionally, virtual team members must overcome the challenges in virtual work environments. Therefore, teams should establish certain rules for solving problems. The following list can be used to define and solve the problems:

- Define and clarify team member roles and responsibilities,
- Describe the process such as action items list, brainstorming, and tools,
- State the problem description,
- List alternative and potential solutions.

Although there are many kinds of problems, they can generally be divided into two types which are simple problems and complex problems. In a simple problem, constraints are well known, the root causes are straight forward which allows designing a solution quickly. In a complex problem, there is no definitive formulation and solution. Solutions to complex problems may not be true or false and every complex problem is unique. Therefore, solutions from other problems cannot be directly used to solve the problems. In summary, while solving a problem, developing a common understanding is essential. Good understanding should be generated among team members. Many ideas should be collected from team members. Moreover, specific attention in addressing a virtual team's structure and behavior of individuals will add success to problem-solving (Braga et al., 2008).

4.9 Technology Point of View for Virtual Team

A virtual work environment enables participants to focus on shared problems through technology. The usual impediments of teams in virtual groups are to tackle problems by relying on technology. Thus, virtual collaboration should be planned and supported by the development of specific skills and the technology that will improve project success (Bradley and Brady, 2008). The virtual environment has many challenges to effective communication (Walvoord et al., 2008). Even being equipped with the most advanced technologies does not make a virtual team effective since team dynamics must also be present for a team to be successful in a virtual environment (Lurey and Raisinghani, 2001). Information sharing is important criteria for technology selection but the greatest impediment in a virtual environment is the implementation of technology (Ebrahim et al., 2012). So virtual teams are technology-mediated groups of people from different backgrounds work on common goals. Therefore, there are different

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technological tools available for the purpose of the meeting for virtual teams (Dekker et al., 2008 and Anderson et al., 2007) which is shown in Table 6.

Table 6. Tools for virtual teams (updated/adapted from Lundy, 2021)

Tool	Example	Advantages	Communication type	Communication mode
Instant messaging and chat	Rocket.chat Slack Microsoft Teams Google Chat Webex Miro Discord	- Instant interaction - View who is available - Low cost - Low set up effort - Remote integrations with chat tools	Synchronous or asynchronous	- Visual - Screen sharing, file sharing - LiveChat - Audio and video conferencing
E-mail	Free applications	- Send messages or files - Low set up effort	Asynchronous	Numerous types of documents in the attached file
Telephone	Voice over internet protocol (VOIP) Old telephone services	- Direct calls - Conference calls - Cost varies - Low set up effort	- Synchronous - Asynchronous for voice mail	Audio
Web conferencing	Go to meeting Zoom Google Meet GlobalMeet join.me Free conference call EasyWebinar ClickMeeting Cisco Webex Meetings BlueJeans by Verizon Google Hangouts	- Live audio - Dynamic video - Screen sharing - Low set up effort - Easy to share screens - Simple setup - Integrates across other systems - Meeting recordings	Synchronous	- Visual - Chat - Video/Audio - File sharing - Screen sharing
Shared services	Google Drive OneDrive Slack Whiteboard Dropbox Trello ClickUp Todoist	- Free data storage - Send large files - Backup your precious files - Share photos, videos, documents - Open and edit different documents - Completely free to use - Access from anywhere	- Synchronous or Asynchronous - Chat	- Text

Virtual communication takes place via e-mail, forums, chat, etc. Virtual communication technology refers to interacting with others in virtual reality. Virtual reality refers to a product

that is a computer-mediated communication. Consequently, a virtual environment provides greater flexibility to teams working from anywhere (Rosa, 2013).

4.10 Types of Collaborative Technology

Collaborative technology can be classified according to the capabilities of technology. There are two types of computer-mediated communication available which are synchronous and asynchronous communication. Synchronous communication is a real-time communication where all participants are online at the same time. Asynchronous communication allows participants to communicate any time of the day or the distance between them (Rosa, 2013).

Group collaboration and collaborative technology can also be divided into quadrants such as same time-same space, the same time-different space, the different time-same space, and different time different space. Table 7 shows the relationship between time and space in virtual teams.

Table 7. Time-space matrix (updated/adapted from Stasko, 2007 and Rosa, 2013)

	Same space	Different space
Same time synchronous	Face to face meeting PC and projector Electronic whiteboard Chat Brainstorming	Chat Teleconference Video conference Audio conference Shared whiteboard
Different time asynchronous	E-mail Workflow systems Document management system Discussion forum	E-mail Document sharing Discussion forum Meeting scheduler

Another common classification category is media richness. Media richness focuses on the level of information richness that technology provides. Richer media is more appropriate for transferring complex messages. A list based on the principles of media richness includes face-to-face interactions, telephone conversations, video conferences, audio conferences, e-mail, and personal written documents (Piccoli, 2001). Nowadays, more and more different tools are being used by organizations to support virtual collaboration. For instance, electronic messaging systems include e-mail, voice mail, and text messaging. They are asynchronous methods of communication and fit into different time different space categories.

Electronic messaging systems enable information to move quickly between teams and individuals. Audio and video systems offer greater media richness than electronic messaging systems but less than face-to-face interaction. These systems enable verbal and nonverbal information to be transmitted. Audio systems support verbal communication but are not helpful

4 A Framework and Technology Point of View for Working Across Boundaries

for nonverbal communication. Video systems allow participants to see some nonverbal signals. A high-quality video conferencing system can allow large groups to work together. However, there are other video applications that connect small numbers of people as well. Computer, video, and audio channels support information exchange between teams and individuals. Chatrooms and instant messages allow same-time (synchronous) information exchange. Web conferencing software allows to show presentations, review documents, and poll audiences with a standard web browser. Web conferences are used with streaming audio over the internet. Some types of these tools are whiteboards, soft boards, team web templates, and discussion databases. Electronic whiteboarding technology is used for digitizing information and saving it in an electronic format that can be printed out. This technology is useful for sharing real-time graphics and for brainstorming sessions. A soft board is an electronic writing surface that has graphics and word processing programs loaded. The user can write or draw on the actual screen and rearrange them on the writing surface and then print out the results or e-mail them to someone. A team web template can be used to set up an interactive website that allows a group to share information. This web template can provide easy access to team informations such as scheduling, contact information, important documents, or forms. It can also provide links to important websites. A message board can be used to conduct online discussions. Discussion database provides electronic forums in which users can exchange information or ideas. Discussion databases are useful for brainstorming, feedback, gathering opinions, and daily reporting of information. Databases support different time different space interactions among team members who may work in different time zones and different locations (Bradley and Brady, 2008). Finally, Slack is the powerhouse messaging app used by remote teams. Slack operates in channels and a company can create channels to track and archive conversations around teams and projects in order to get things done. Slack's search feature ensures that you will never "lose" a conversation about a project (Digneo, 2019).

4.11 Process Point of View for Virtual Team

The company's processes shall be re-structured for virtual teams as opposed to face-to-face teams. Therefore, it is important to understand the virtual team processes which mean not only the hardware and software also the ability of team members to actively participate teamwork process (Rosen et al., 2007). Proximity enables team members to work informally. Studies showed that lack of physical interactions decreases the cohesiveness of virtual teams. In addition to this, the physical absence of a formal leader causes a lack of motivation. Virtual teams rarely meet face-to-face thus synchronously written documents help virtual teams to

overcome challenges associated with spoken language. On the other hand, virtual team members must have clear roles and responsibilities. Lack of visibility may cause virtual team members to feel less responsible for the tasks. Therefore, it is important to schedule deadlines and coordinate efforts to increase accountability (Ebrahim et al., 2009).

4.12 Successful Key Factors of Virtual Team

Success starts with a clear and shared goal and identified outcomes. If all members start with the same vision and work plan, virtual team members will progress effectively. Everyone needs to take an active role in the project and should remain aligned to the purpose (Hoefling, 2008). Organizations establish teams with the necessary expertise and skills to collaborate on an organizational task. The advantage of this structure is that it integrates knowledge with distributed team members which facilitates the achievement of more effective results (Alsharo et al., 2017).

Table 8. Successful key factors of virtual teams (adapted from Leppisaari et al., 2018)

Stages of virtual teams	Key features	Success factor
Organization	<ul style="list-style-type: none"> • Project design • Member 	<ul style="list-style-type: none"> • The design of interaction • Identifying potential members
Socio-emotional processes	<ul style="list-style-type: none"> • Goal setting • Developing shared language • Team building, trust, cohesion 	<ul style="list-style-type: none"> • Relationship building • Online meetings • Personal & institutional trust • Mixed amount of managerial control
Improving performance – task processes	<ul style="list-style-type: none"> • Communication, knowledge sharing • Learning activities • Coordination & commitment of the team 	<ul style="list-style-type: none"> • The right selection of technology • Leadership/management motivation • Right balance between structure and flexibility • Time management • Cultural differences vs. understanding diversity
Outcomes	<ul style="list-style-type: none"> • Performance • Satisfaction 	<ul style="list-style-type: none"> • Interaction • Effective communication methods • Team viability

Virtual team development starts with selecting the right staff with the right competencies. Virtual cooperation requires numerous additional skills like communication and self-organizational competencies, willingness to learn, flexibility, creativity, initiative, and being positive toward cooperative work. Virtual team development is not only about choosing the right people, but also supporting the team from the beginning. It is significant that from the

beginning till the end of the project, information and all sources need to be distributed to create shared responsibility and to motivate participation (Zilli, 2016). Also, knowledge sharing and idea exchange is crucial for virtual team collaboration. Knowledge sharing is dependent on the willingness of team members to share the unique knowledge they have (Alsharo et al., 2017). In order to support key success factors for virtual team development remote coaching, trust and conflict management, intercultural and communication competencies, staffing, organizing work plans, and distributing roles are vital facilitators for enhancing motivation (Zilli, 2016).

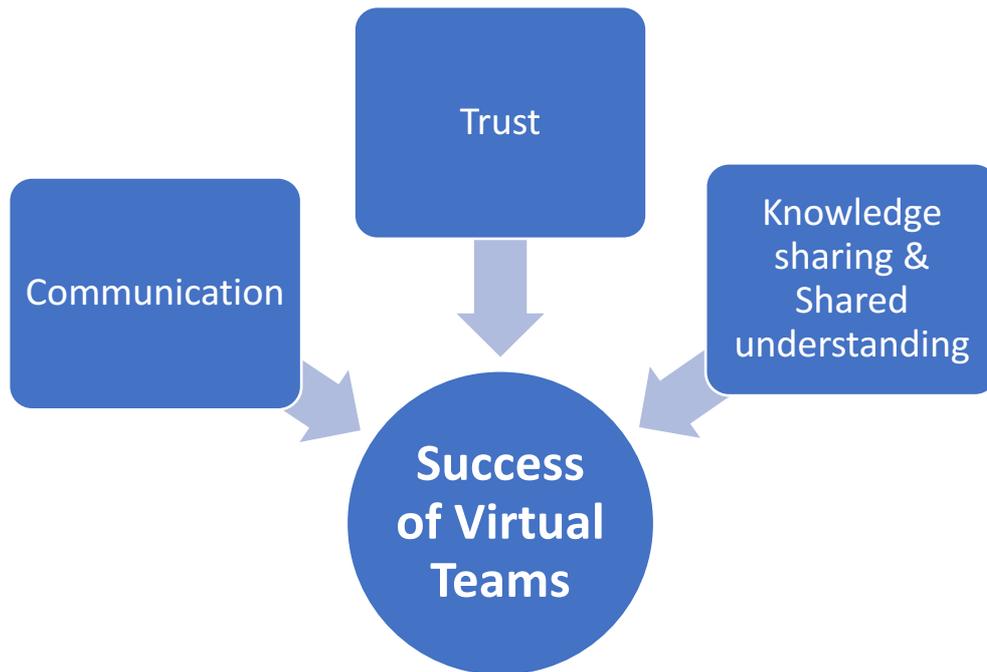


Figure 7. Critical success factors for virtual teams (adapted from Havar-Simonovich and Simonovich, 2016)

Contributions from both the organization and from individual team members are important for the success of virtual teams. The development of relationships shared understanding, trust and communication will lead to effective virtual collaboration which is shown in the Figure 7. These three factors are extremely related to each other. Shared understanding is the key aspect of the group task. Shared understanding within a team or group can be described as mutual knowledge about information and experiences that can lead to an efficient work environment (Baan and Maznevski, 2008). On the other hand, shared understanding can be built from individual understanding. The purpose is to reach a shared understanding. The team can build a shared understanding of key aspects of the task, objectives, and this process is dependent on the presence of trust within the team. Trust is a glue that holds team members together in virtual environments. Also, it leads to high performance for remote teams. Effective communication requires active participation by the team members that goals are well understood. It also

requires shared understanding by the teams to be more efficient and effective. In summary, shared understanding is improved by an individual line of vision that requires trust which is created through effective communication and based on good shared understanding. Therefore, in virtual work environments, it is important to take the status of these factors and work on their development because the relationship among these three factors leads to high performance in virtual work environments (Baan and Maznevski, 2008).

4.12.1 Organizational Successful Virtual Collaboration

It is important that organizations create deeper relationships among the team members. Organizations should provide face-to-face communication at the early stages of virtual collaboration in order to develop relationships and trust. If a face-to-face meeting is not possible, organizations should encourage all team members to e-mail, video, or telephone conferencing or group e-mails or provide collaborative software tools for communication. Additionally, organizations should keep team members constant in order to benefit from the relationship that has already been built. Once team members feel comfortable with each other, organizations should establish a system where they can discuss the responsibilities of the team and the big picture of the project. Additionally, organizations should be responsive in dealing with virtual team members. In order to promote organizational trust, all members of the company need to understand that communicating responsively with virtual employees is expected in virtual environments. Finally, organizations should provide training for employees and managers on working in a virtual environment and how to work successfully with virtual teams (Beyerlein et al., 2008).

4.12.2 Individual Team Members Successful Virtual Collaboration

Members of the team also have responsibilities to establish effective virtual collaboration. In order to develop a deeper and more effective relationships with other team members, it is important to share information and experience with other team members. Also, every team member should know his/her responsibility thus, a shared understanding of the team goal is essential in virtual environments. All team should understand their roles and team members should support each other. If they do not support each other the team's collaboration may negatively have affected, which decreases performance and innovation. Consequently, achieving a trusting relationship among all members is the key factor for effective collaboration. Therefore, team members should build trust by fulfilling all promises and by meeting all deadlines. Team members should also be responsive to others by communicating

regularly. Effective virtual collaboration can be achieved with solid trust, shared understanding, and strong relationships among team members (Beyerlein et al., 2008).

4.13 Summary

Virtual teams work across boundaries. Team members connect through computer-mediated communication. That's why performance is affected by these hurdles. Continuous support is essential for the teams to reach their goal. The support requires investment in equipment and resources, training, and leadership. Without reducing hurdles for crossing boundaries, the team will be stuck, and the target cannot be met. As a consequence;

- Crossing boundary challenges should be managed for virtual teams to achieve the goals.
- Team members have to learn how to collaborate with other team members.
- Support systems should be designed for the teams' needs, leadership, learning, and performance measurement.
- Training should be provided to build cultural competencies, so all members can feel ownership for the project (Beyerlein et al., 2008).
- Emotional bandwidth should be created among virtual team members.
- The team members should be engaged to produce successful outcomes. Because an effective team can achieve complete and successful results (Hoefling, 2008).

Advances in technology are creating various opportunities for virtual collaboration. An understanding of collaborative technology, team processes, and culture will guide effective collaboration. High-quality human interaction through technology brings together innovative solutions in virtual environments. Home and work-life balance is a challenge in virtual teams thus, in virtual working collaboration, team members should learn to establish team norms and they should be respectful to their teammate's work/life balance. Moreover, virtual teams could have cultural differences which also include educational, functional, religious differences. That is why it is important to include the right people at the right time (Fisher, 2008). On the other hand, technological tools are very helpful for virtual teams. Tools can help virtual teams to create a shared work culture and increase productivity. Video systems allow the user to see nonverbal signals and support visual object information. However, the low-quality video resolution in videoconferencing may lack the best practices of videoconferencing and participants cannot see the nonverbal signals well. People can view presentations with graphics and join training by using electronic meeting systems. For effective collaboration, it is important to use the technology appropriately, understand the team process and the organizational culture (Bradley and Brady, 2008). In contrast, ineffective team meetings can

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reduce the productivity and efficiency of the project and employees. Virtual team meetings can be ineffective if;

- the goal of the meeting is not clearly defined,
- the agenda is not disseminated before the meeting,
- the meeting is dominated by the same members,
- the team members cannot express their views.

In summary, virtual meetings can be effective with appropriate planning. Virtual collaboration cannot be successful without efficient virtual meetings. Meetings are crucial for remote teams to conduct their business. Moreover, effective collaboration is dependent on the organizations' support. Organizations should support their virtual teams in terms of technology, training, and education. Consequently, virtual meetings should be planned well and should include follow-up to increase efficiency (Bradley and Brady, 2008).

5 Research Model

Virtual team members interact and collaborate through communication tools (Dávideková and Hvorecký, 2017). In this theoretical model, we propose that knowledge sharing positively affects trust and team effectiveness in virtual work environments. Moreover, higher levels of trust positively affect team effectiveness. The knowledge-based model states that organizations gather knowledgeable and skilled individuals to perform organizational tasks. Teams perform better when they have skillful members relevant to the task. In virtual environments, the knowledge must be shared amongst team members through the use of information technologies. In the long-term collaborations, participants and team members share their knowledge without any expectations which is the main benefit of effective collaboration. To collaborate effectively, virtual teams should distribute knowledge adequately otherwise, virtual teams will be less efficient, have higher costs while searching information, inadequate decision making due to the missing data. Thus, knowledge sharing enables effective team outcomes (Alsharo et al., 2017). In virtual teams, members are linked through a common goal. The success, failure, and challenges of any virtual team are affected by the interaction of four dimensions which are purpose, time, people, and links (Juneja, Management Study Guide Content).

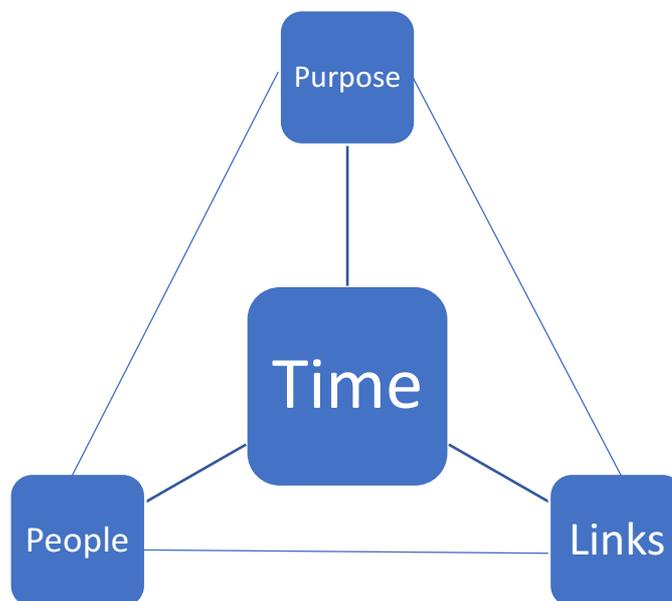


Figure 8. Four-dimensional model of virtual teams (adapted from Juneja, Management Study Guide Content Team, 2019)

Each of these four dimensions can be further analyzed in three systems of inputs, processes, and outputs which are shown in Table 9.

Table 9. Virtual team elements (adapted from Juneja, Management Study Guide Content Team, 2019)

	Inputs	Processes	Outputs
Purpose	Goal	Task	Result
People	Members	Management/Leadership	Levels
Links	Media/Communication tools	Interactions	Relationships
Time	Calendar	Project planning	Life cycles

Purpose is one of the significant key factors for a virtual team. Because well-defined goals, tasks, and measurable results guide the team towards the desired direction.

People, members of the virtual team must work at internal and external organizational levels. At the internal organizational level, they have to work with other team members of the same team. At the external level, they have to work with team members of the other teams, customers, partners, etc. Therefore, a productive virtual team needs integration at both internal and external levels in virtual work environments (Juneja, Management Study Guide Content).

Links, virtual team members are connected to each other through communication tools such as emails, video/audio conferencing, skype, instant messaging, etc. Such communication tools reduce the boundaries between members and develop trust among them.

Time has been related to people, purpose, and links. In virtual teams, it is not possible to meet at the same time and at the same place that's why, time zone differences, language, and behavioral differences become more difficult (Jimenez et al., 2017). Thus, it is important to organize the meetings according to each member's calendar to discuss and track the tasks and the project (Juneja, Management Study Guide Content).

5.1 Virtual Team Analysis Model

The virtual team members interact through interdependent tasks to achieve a common goal and collaborate through communication technology tools. In virtual work environments, face-to-face interaction is mostly limited and team members may speak different native languages who are situated in different countries. Further, team members rarely or never see each other face-to-face in person. Thus, performance, skills of individuals, and effective collaboration become important in virtual work environments (Dávideková and Hvorecký, 2017).

It is clear that virtual teams may face significant impediments to effective collaboration and that the failure may be the result in case they cannot find a solution. The model we present can help to analyze the reasons for failure and can support the design of virtual teams. The aim of this model is not to limit the analysis of collaborative activities and also to provide insights and ideas to the virtual teams for their values.

5 Research Model

The original model from (Andriessen, 2002) is shown in Figure 9. In terms of the original model, three levels of behavior are taken into account: individual behavior based on activity theory; group processes based on coordination theory; and social perspective based on structure theory.

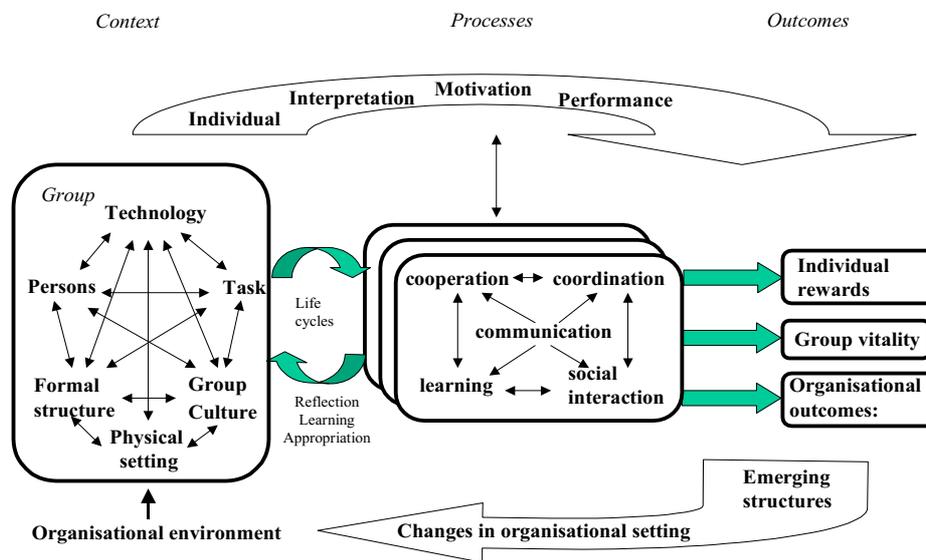


Figure 9. The Dynamic Group Interaction Model (Andriessen, 2002) (the original figure)

Virtual teams offer a variety of opportunities for collaboration across boundaries. However, virtual teams face challenges, in terms of communication and collaboration. We have presented the model for team analysis. On the basis of our analysis, we suggest that virtual teams should more explicitly pay attention to issues of team building, group culture, knowledge sharing, trust, and social interaction in order to work and collaborate effectively. Virtual teams should also benefit from the use of robust IT infrastructure. Therefore, in our model all these points, change requests in an organizational setting and organizational environment details are significant and added to the model which is shown in Figure 10.

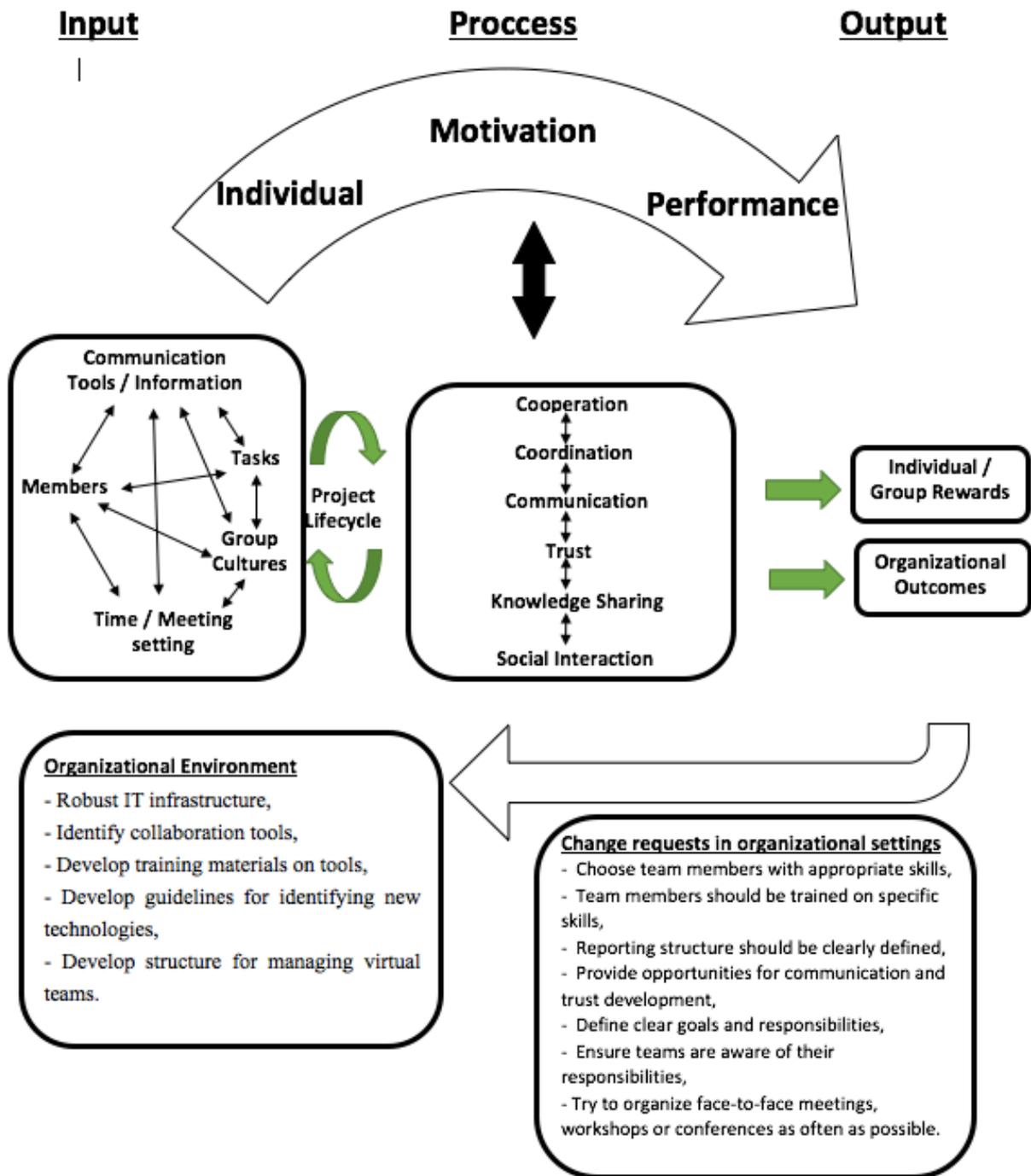


Figure 10. Virtual team's interaction model (updated/adapted from Andriessen, 2002 and Morley et al., 2015).

The model has the following principles:

- Effectiveness of groups can be analyzed as outcomes which include individual /group rewards and organizational settings.
- The effectiveness of a group depends on communication, coordination, cooperation, and trust. These processes need to be aligned to one another.

5 Research Model

- The quality of group processes depends on the task of the team, tools, member characteristics (knowledge, skills, etc.), team structure (role division), cultural difference, and time-space setting. These characteristics need to match with each other in order to support the processes (Godar and Ferris, 2004).

The aim of this model is to investigate how virtual teams and collaboration are implemented in an organizational setting. This study includes a survey of virtual team members to understand their experiences and a review of the technologies available to ease collaboration. Regarding the model, first of all, organizations should invest in the relevant IT infrastructure and provide training. IT infrastructure must be common to all team members and all team members must have access to information and opportunities. Furthermore, management should ensure that tools and techniques are disseminated properly throughout the members. On the other hand, the team manager should have the ability to develop the relationship between team members to identify and solve conflict within the team. They should have strong team participation skills with experience of working with different teams, particularly using technology to communicate. It is also significant that team members are trained on using communication tools such as audio-video conferencing, voice mail, email, and cultural awareness. In addition to this, virtual teams should meet face-to-face at least one time to create trust and relationships between team members. Moreover, clear goals and responsibilities should be defined for working effectively in virtual teams. Consequently, the organization should update the relevant IT structure. They should be aware of the skills and abilities of team members who are working in the dispersed environment. Furthermore, an organization's culture, processes, management system, tools, and techniques are significant through the business in the virtual environment (Morley et al., 2015).

5.2 Model for the Analysis of Traditional/Face-to-face Teams

Traditional teams work in close physical proximity and have face-to-face interactions while virtual teams are physically distributed and rely on communication technologies for collaboration and information exchange. Geographically dispersed teams do not have close physical proximity and they have slow feedback, lack of emotions, and lack of visual contact. In contrast, traditional team researches show that coordination by team members is easier than in virtual teams. Also, face-to-face groups have greater interaction quality because they have verbal and non-verbal cues, immediate feedback as compared to the audio/video conferencing supported groups. Moreover, communication through communication channels may lead to miscommunications or misinterpretations. As cultures differ knowledge sharing may be

different as well (Gera, 2013). For instance, the study by Branson et al. 2008, shows that face-to-face teams have more creative and innovative solutions, members supported and assisted each other.

In the original model in Figure 11, the team members are together in face-to-face meetings for discussion and experience sharing as an effective means of informal or social learning.

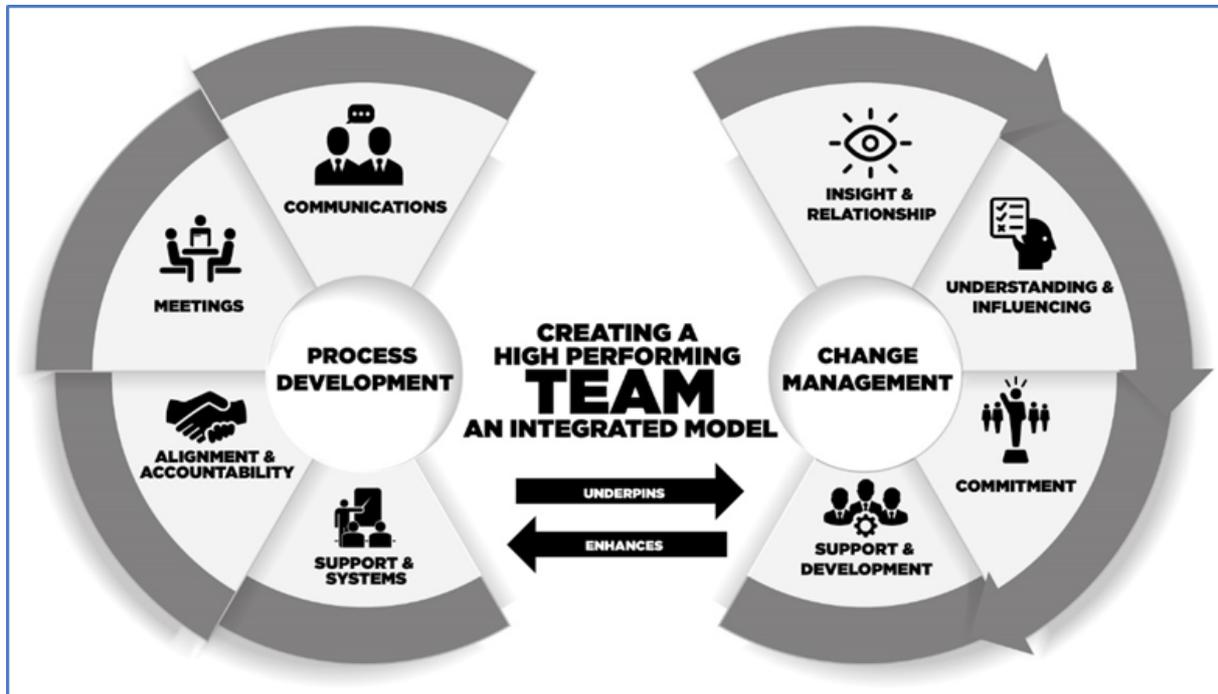


Figure 11. Integrated Model of High Performing Teams (adapted from <https://businesssimulations.com/tags/high-performing-teams>) (the original figure)

It is clear that as technology developed distance and time obstacles are disappearing. The demand for virtual communication is increasing for at least some domains. In spite of increasing the demand for virtual communication face-to-face communication has many advantages. For instance, face-to-face contact enables the transfer of tacit knowledge. During face-to-face communication, it is possible to see the visual cues from the audience to gain feedback and make adjustments if necessary. Visual cues and social presence in face-to-face communication also enable to learn about one another's background, skills, experiences which build trust within groups (Heller, 2010). Therefore, according to our model and suggestion which is shown in Figure 12, all elements of face-to-face communication have a relation with each other. And all these elements are significant for the process development during the project lifecycle. The model we present can support the design of traditional teams. The aim of this model is to provide insights and ideas to the traditional teams for their values.

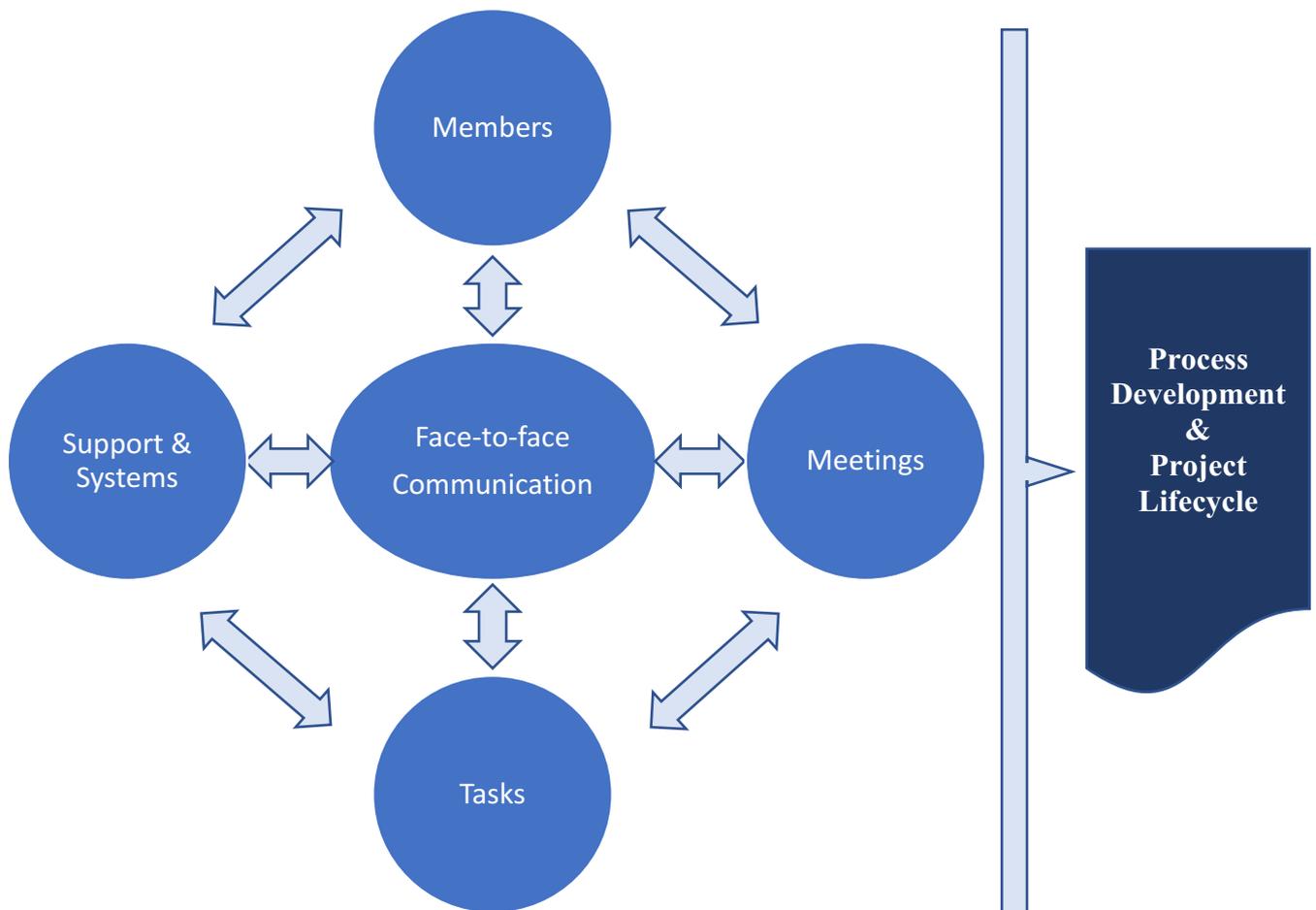


Figure 12. Model of face-to-face team communication (adapted/updated from <https://businesssimulations.com/tags/high-performing-teams>)

5.3 Comparison of the Model for Virtual and Traditional Teams

The satisfaction of members is usually lower compared to face-to-face teams when working in virtual environments due to the challenges. Virtual teams use technology across boundaries to accomplish a defined goal. For instance, virtual team members are physically separated, they use information technologies to collaborate and they are temporary. However, virtual teams have a series of advantages such as creativity and innovation of products. Virtual teams also support knowledge sharing between members and teams. In contrast, working in a virtual environment has disadvantages such as the discussion time is limited, the intensity of trust between members is lower. Thus, members who trust each other are more satisfied with the collaboration. Therefore, the members of traditional teams are usually more satisfied with the collaboration, decision-making process within the team, knowledge sharing, conflict management, task assignment, and achievement is relatively efficient (Cicei, 2012).

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There are some fundamental differences between virtual and traditional teams such as team formation, trust, communication, and collaboration. For instance, in virtual teams, team member competencies, team diversity, roles, trust, and collaboration process are linked to the decision-making process, challenges, rules in knowledge sharing, and conflict management. Further, trust is the most important factor for traditional and virtual teams, but it is more difficult to implement in virtual teams. Team processes and behavior have an impact on the team's effectiveness, satisfaction, and team cohesion. The main team dimensions are vision, task-orientation innovation, conflict management, commitment, responsibility, and trust. They are crucial for virtual team creativity and to overcome challenges. The importance of dimensions is a bit different in virtual teams compared to face-to-face teams. Consequently, there are differences between traditional and virtual teams. It is also possible that virtual teams may differ from each other by the degree of virtuality, team size, etc. The degree of virtuality influences team processes and team performance. By analyzing the influence of virtuality on team processes and performance it is possible to estimate the virtuality boundary, team member distance, communication, and collaboration effectiveness. According to the analysis results, it is possible to prepare a recommendation for teams such as which member skills are crucial for such team performance, which decision-making methods should be used to increase the team performance, whether the team specification is closer to a virtual or traditional team, etc., (Krawczyk-Bryłka, 2017).

Consequently, as technology develops, virtual communication is gaining attention for many organizations. Organizations are trying to find out whether virtual communication is an alternative to face-to-face communication. As explained in the previous sections, virtual communication is promising for organizations if it is used effectively and appropriately. Organizations must recognize that virtual communication is encouraging with the right tools, technology, and people. Thus, organizations can benefit from virtual technologies to achieve satisfying results. Although virtual communication offers many advantages it has many challenges and still, there is no replacement for visual cues in face-to-face dialogue. Even though face-to-face communication can be difficult and costly and it can be very valuable for internal communications (Heller, 2010).

5.4 Applying the Model

Virtual teams can overcome many challenges. Team collaboration is the backbone of the team. It supports team success and effectiveness. However, collaboration depends on trust, knowledge sharing between the team, social interaction among team members. Without these

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components' teams cannot make effective decisions. Forming trust in virtual teams is difficult as members are in different locations, lack of face-to-face interaction, working in different time zones. With the lack of physical interaction, virtual team members should demonstrate their willingness for the collaborative tasks (Alsharo et al., 2017). Virtual teams have many opportunities for collaboration across boundaries. Based on the model, virtual teams should be careful on team building, awareness, knowledge sharing, and communication tools in order to collaborate effectively (Godar and Ferris, 2004).

Team building is a significant key factor for virtual teams. Because team building is a critical aspect of team performance, development of trust, cohesion, communication, and social interaction among team members. In some cases, face-to-face kick-off meeting is organized to benefit strongly from virtual teams. Managers or leaders should organize such meetings whenever possible to increase the motivation and performance of virtual teams. On the other hand, in virtual teams, the tools, information exchange, member skills and characteristics, the team culture need to be adjusted. In terms of the organizational environment, virtual teams require robust IT infrastructure and tools for communication. The tools should be easy to use and accessible for all members. Moreover, cultural diversity is important in virtual teams. In order to avoid conflicts, project members should be trained on cultural diversity. When members trust each other, virtual teams will be able to benefit from the diversity of members (Godar and Ferris, 2004).

As the virtual teams develop new knowledge our research model can serve as a metaphor. It covers the cycle of the team's learning from an initial step through its features to a final solution accepted by the team. Our proposed model can serve as a manual for building an appropriate environment for virtual collaboration in their technical environment and for communication as well. To achieve this, successful communication is the key factor from the beginning of the project and while building the team and is highly important for controlling the process (Dávideková and Hvorecký, 2017).

Virtual teams have many challenges since team members are from different nations and cultures. That's why virtual team members should have knowledge about challenges and solutions. There are some reflections about the factors that affect virtual team settings however, there has not been much systematic investigation about virtual settings. It is not easy to find well-defined model that investigates the problem of complex systems for virtual teams (Cagiltay et al., 2015). Therefore, at this point, we cannot clearly identify and explore all of the issues related to virtual work environments. There are still many questions that need to be addressed for a better understanding of the issues among multicultural virtual teams. In this

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research, we test our proposed research model for analyzing survey data. We focused on virtual team members who work in an organization setting in different industries and we propose that trust positively affects knowledge sharing and team effectiveness in virtual work environments. In addition, face-to-face meeting in virtual team settings moderates the relationship between team effectiveness and communication, with cultural difference influencing the impact of communication on team effectiveness. While collecting the data, we identified individuals and groups who best represented our population of interest. This is possible from LinkedIn who post detailed resumes about their experiences. LinkedIn also provides suggestions of other people and similar companies. These features enabled us to target subjects for our study. Emails were sent to group members and individually. A brief description of the study was given with a link to access the survey online. Over 1000 invitations were sent to participate. A total of 712 subjects completed the survey. The variable of interest is trust, communication, team effectiveness, and knowledge sharing. Our survey questions are shown in Appendix 80.

Organizations are distributed knowledge systems to identify knowledge resources for employees. Even though communication technologies impact knowledge sharing, trust, leadership, and other social factors also impact virtual teamwork in a positive or negative way. Virtual teams are gathered of skilled people who are expected to perform an organizational task. In virtual teams, the technology-mediated communication and lack of face-to-face interaction cause loss of each other's trust. Trust is expected to affect team effectiveness and assist team members to overcome the physical barrier (Kanawattanachi and Yoo, 2002). Virtual team members need to provide solid evidence of their trustworthiness for other team members to trust them (Alsharo, 2013). In virtual teams sharing knowledge is a complex issue. Because on one hand, when knowledge is shared by others it could be seen that an organization loses its unique advantage. On the other hand, knowledge sharing would be appeared valuable in the organization (Gilmour, 2003). Consequently, virtual team members need to demonstrate different behaviors to the working groups in order to prove their integrity.

The project management of virtual teams is different than the traditional teams. Project risks in virtual teams are technology, project complexity, high interdependency between tasks. All these factors must be managed alongside geographic and cultural dimensions. Some studies showed that technological issues, such as wrong tool selection or limited internet access as well as a team and team member satisfaction affect the virtual team performance and effectiveness. Performance, effectiveness, and satisfaction are the key issues in the evaluation of virtual teams

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(Weimann et al., 2013). Finally, technology use is substantial for virtual teams which supports communication, collaboration, and project management tasks which are shown in Figure 13.



Figure 13. Conditions, context and technology use of virtual teams (updated/adapted from Weimann et al., 2013 and Ebrahim et al., 2012)

5.5 Discussion and Summary

The literature shows that there are many factors that affect the performance of virtual teams. Each member of virtual teams has important responsibilities for successful teamwork. To ensure virtual teams work effectively it is important to select the right people and the right technology. But technology alone can never provide all of the solutions (Kimble, 2011). For instance, managers/leaders should have enough knowledge about preparing teams for challenging situations. Team members should use the right technologies to collaborate (Cagiltay et al., 2015). These critical issues are summarized in table 10 below:

Table 10. Summary of successful virtual team setting (updated/adapted from Cagiltay et al., 2015)

Managers/Leaders	<ul style="list-style-type: none"> • Define clear goals. • Begin with face-to-face team building session then move into a virtual setting. • Establish personal relationships. • Build trust. • Use rich communication channels and the right technology. • In case of a conflict, clarify the problem, give clear instructions, and give constructive feedback on results.
Team members	<ul style="list-style-type: none"> • Identify other team members` cultural differences. • Respect and tolerate the differences. • Realize the lack of social cues.

In virtual teams, to collaborate effectively, knowledge should be shared and integrated. On the other hand, face-to-face communication is significant for virtual teams. Because without the benefit of face-to-face communication virtual teams take longer to collaborate effectively. However, virtual teams have many challenges they are able to share more knowledge and ideas openly, they are collaborating in order to achieve a common goal and they are trying to use modern technologies which affect team outcomes. Further, trust is the key factor for reducing risks and enabling effective collaboration among team members within the virtual team settings. Without trust, team members can collaborate, but team effectiveness may be less strong (Alsharo et al., 2017). In this research, we try to identify the impact of trust, distance, cultural difference, time zones, language difference on virtual teams` outcomes, and the significance of knowledge sharing to virtual team effectiveness. Moreover, this research investigates the relationship between knowledge sharing and trust, and how this relationship affects virtual team effectiveness.

6 Case Study, Research Method and Hypotheses

6.1 Research on Virtual Work Environment: A Case Study

Nowadays the trend is to perform information technology (IT) projects remotely. Companies are using complex IT systems and virtual teams are using advanced IT systems such as email, instant messaging, audio/video conferencing to communicate with each other (Gheni et al., 2019). The management of globally distributed software teams is complex because of communication, collaboration, social and cultural boundaries (Kiely et al., 2010 and Guzmán et al., 2013). Virtual teams rely on communication, collaboration and information exchange and these factors affect virtual teams' efficiency (Gheni et al., 2016). With the limited face-to-face interactions, virtual teams lack the facial implications that may cause misunderstandings and confusion (Zhu and Lee, 2017). Furthermore, in the current global pandemic, organizations need to work with virtual teams thus virtual team settings should be taken into account. Due to the COVID-19, many organizations start working from home, and working virtually is a big challenge for some organizations (Gheni et al., 2021). According to the literature review and my current experience working with virtual teams showed that there are challenges within global virtual teams and also in my IT project and these challenges can affect project performance and may lead to project failure. So, there is a need to analyze the challenges in virtual team settings and develop a model to improve the efficiency of global virtual teams in IT projects. An IT project involves different activities such as defining the requirements, design, coding, testing, implementation, and release. Thus, it is critical to have well-defined requirements document in order to ensure a successful project (Edwards and Sridhar, 2003).

This study examines the factors that influence global virtual team efficiency: language difference, cultural difference, distance, knowledge sharing, trust, time difference, team cohesion, and goal setting what is particularly common in global virtual settings in IT project. Then a conceptual model is developed to guide future research on virtual teams involved in software projects and other industrial domains as well. Virtual teams are a key coordinating structure for this use case. This use case is related to information technology. In the information technology sector, the software industry switches to a more agile way of working. But on the other hand, the software industry must adhere to safety standards. The aim of this use case is allowing software teams to increase the development/production without sacrificing the quality. For instance, in this use case, our company is acting as a solution provider and has many customers in Europe and in the USA. Our company develops a range of software applications for customers in aerospace and defense, automotive, industrial automation, medical devices,

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telecommunications, finance, and healthcare/insurance. As part of the services it provides, it offers high-quality technical support to its customers. Now a virtual team-based solution enabled the company to find a more effective way of supporting the customers. A multimedia communications link, with audio/video capability, supports direct interaction between users and experts. Taking this approach, the geographical flexibility of the experts and the responsiveness of the system has increased. There are 36 partners in the project, and they are working in different domains. There are also several academic and research institutions are working on the project and they provide research and consultancy services for the industry. Consequently, in this use case, large volumes of multimedia information including audio, images, text, and data are transmitted between partners. Further, whole partners in the project are working virtually. Each organization has its own team from different backgrounds and all these teams are working in a virtual environment. Interdisciplinary teams are able to manage complex problems. Face-to-face interaction and communication are a necessary part of teamwork. In this use case, interdisciplinary teams work for different organizations and in different locations. The various stages of team organization and development are, forming teams, building relationships and trust, developing team goals, strengthening interpersonal skills, communicating effectively with team members, and dealing with conflict. However, these stages may imply that maximizing team performance requires members in the same place at the same time. Therefore, face-to-face meetings and several workshops have been organized during the project period. In the project, team members and organizations are from various disciplines and domains such as commercial companies, research institutes, universities, etc. This project includes the potential of adding new and improved solutions and know-how to organizations' practice and building new revenue by linking research and industrial practice. In terms of the use case, the adoption of virtual teams to link work and practice offers exciting potential for future use. Virtual teams offer promising opportunities in a variety of industries and can be designed for purposes ranging from interdisciplinary team management and supporting self-management and different technics. However, even the system is well designed, the gaps and absence of coordination, collaboration, and trust create barriers and virtual team members have to overcome these barriers. Please see the system infrastructure for this use case in Table 11.

Table 11. Virtual system infrastructure support (adapted from Kamouri and Richert, 2008)

	Infrastructure components	Distributed work
Workplace components	1. Workspace priority 2. Work locations 3. Home as a work location 4. Workplace office	1. Group 2. Distributed 3. Yes, home as a work location 4. Shared by many
Technology components	1. Technology access 2. Document management 3. Telephone and voice services 4. Collaboration technologies 5. Technical support	1. Portable 2. Electronic 3. Robust 4. Robust 5. Company
Organization components	1. Group or team processes 2. Training 3. Managing performance 4. Accessibility 5. Talent pool hiring	1. Planned 2. Virtual 3. Result based 4. Protocols 5. Skill based

As seen from the table, infrastructure components support distributed work. For each infrastructure component, there are choices of how to implement. When components are selected the configuration must be done carefully in order to avoid conflict with other choices. Consequently, infrastructure components and distributed work should be well designed to identify the business objectives and key success factors.

In this research, a range of benefits to the organizations and individuals concerned, including geographical flexibility for team members, improved responsiveness, more satisfying working environments, and reduced costs. However, this study explores some of the challenges faced in virtual teams. Further, we will try to explore how organizations respond to these challenges under two headings which are technical problems in the sense that technology can help to solve the problems and organizational where the solution of the problem is mainly related to team members and how they communicate. A use case in this research is a project in which virtual teams perform in a controlled and manageable environment. First of all, the problem is selected to work on which is difficult to solve traditionally. Then, project planning is done in terms of management, staff, and information systems which are explained in detail below:

6.2 Research Method

Several issues have been identified in the previous chapters as influencing factors in virtual teams such as distance, time zones, leadership, cultural difference, language difference, and trust. These factors influence project outcomes and coordination mechanisms. Coordination mechanisms involve; i) coordination by standards, ii) coordination by plans, iii) coordination by formal mutual coherence, iv) coordination by informal mutual coherence. Coordination by

standards refers to methodologies, codes of practice, etc., which are used by team members. Coordination by plans refers to project plans, schedules, etc., to coordinate the team members. Coordination by formal mutual coherence refers to project meetings for team members to interact in a pre-defined manner. Coordination by informal mutual coherence refers to interacting in an informal manner such as e-mails, informal meetings, phone calls, and communications. Relation between virtual team influencing factors and coordination mechanisms are shown in the figure below:



Figure 14. The relationships between virtual team influencing factors and coordination mechanisms (updated/adapted from Kiely et al., 2010)

As shown from the Figure 14, the effectiveness of standards, plans, informal and formal mutual coherence are affected by distance, trust, time zones, cultural differences, and language differences (Kiely et al., 2010). The objective of this research is to investigate the impact of distance, trust, language difference, cultural difference, time difference, knowledge sharing on virtual teams. As an initial step, a conceptual model is presented, and the next step is building a theory and producing hypotheses for empirical research. A single case study research approach is selected for theory building and refinement. The case study emphasizes the understanding of empirical data in natural settings and is particularly fit for the purpose of exploring relationships between virtual team influencing factors. The case study involves 36 partners (industrial companies, research centers, universities, and institutions, etc.). From each organization, at least one or two people are representing the organization. This project is chosen

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for study on the basis of its use of virtual teams and the project will advance the state of the art in test automation for software teams. This specific project met several important criteria. Because this project is operated over several geographically dispersed project locations with multiple time zones and the team is culturally diverse. The project focused on increasing the development speed without sacrificing the quality of software development teams. The project is planned for 36 months duration with team members located in six geographical locations – Germany, Sweden, Finland, Spain, Turkey, and Netherlands. There are upwards of 120 team members working on the project in different locations at any point in time. The team is split into the work packages, such as project management, industrial use cases, test effectiveness, test priorities, test quality & standards, dissemination, and exploitation. In addition to that, each work package has sub-units. All team members are in different geographical locations and have responsibilities for different work packages and sub-units. Data is gathered from a wide variety of team members. Thus, participants were selected from all project sites and those participating in the study performed a range of project roles within the team (e.g., project lead, country coordinator, project manager, software engineer/developer, software tester, researcher, PhD student, etc.). Follow-up emails were used to distribute the survey to different organizations. The research utilized a model from a theory in formulating and determining the hypotheses about the relationships between influencing factors of virtual teams. This process continued in an iterative manner and resulted in the evaluation of relationships.

6.2.1 The Right Team

Once the budget is approved, team composition is the next starting point. Organizations started to find the people suited to virtual teamwork and group them with the right size aligning tasks to appropriate members.

6.2.3 People

In this project, it is important to work with successful virtual team players. For this project we need a few things in common;

- Excellent communication skills,
- High emotional intelligence,
- An ability to work independently,
- Sensitivity to cultural diversity,
- Appropriate hardware, software, and high-speed internet for all members.

6.2.4 Team Size

In this project, companies are from large multinationals to medium-sized companies, research institutes, and universities. There are nearly 100 people involved in the virtual team project. Furthermore, there are different work packages and tasks in the project and each work package and task have between 10 to 50 team members. Thus, to optimize the group's performance each member must be aware of their accountability. In this project, we have seven work packages, and work packages 3, 4, and 5 have their sub-tasks which are task 1, task 2, task 3, task 4, and task 5. Each organization or partner has responsibilities for different work packages and tasks. Therefore, teams are formed efficiently.

6.2.5 Roles

In our project and the use case, task sharing and managing the progress are important. Therefore, in this use case we have;

- Project coordinator/leader,
- Work package leads,
- Task leads,
- Team members (problem owners, solution providers, knowledge providers),
- External assessment team.

The core is the team members responsible for performing the primary work. They are task owners and work on tasks based on specific skill sets. Core team members must believe in the project and take the responsibility to reach the goal.

6.2.6 Operational Coordination

Operational coordination is key to forming trust-based relationships in virtual environments and without effective communication, effective teamwork is not possible. We have a project leader who has direct supervision over core team members. Additionally, we have work package leads who have sufficient competence to assure accountability. Moreover, the external assessment team is reviewing the project outputs and giving the feedback about overall project status.

6.2.7 Building Trust and Open Dialogue

Trust is the significant key success factor for virtual teams. In our project, it took some time to build trust between organizations and team members. When we have established trust, we have

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set up an open transparent dialogue. We are using daily asynchronous interaction with regular synchronous screen shared audio sessions for communication.

6.2.8 Defining Goals and Progress Tracking

Being globally dispersed often means it is difficult to meet face to face frequently. Video or audio-conferencing technology can overcome the hurdles for communication problems but only the technology is not the solution. Two or three times a year we are trying to meet face-to-face. We are organizing workshops and conferences and we are meeting/discussing as much as possible. On the other hand, we need to track the progress thus, we have a project plan. We are applying an agile framework and we have sprints. In the sprint planning meetings tasks, clearly defined, objectives, milestones, and budgets are clarified. For progress tracking, we are organizing weekly or bi-weekly audio conferences. There is a variety of web-based tools that can be easily integrated into our platform. The best tool for the task is open-source tools that are secure and easily integrated. The objective is to keep it simple to manage the progress. Another important point is that team members should stay synchronized during the project. In our project, we are using Google Drive for our deliverables (Figure 15), meeting minutes, and other documents. At the same time, all team members can comment and work on the documents and chat as well.

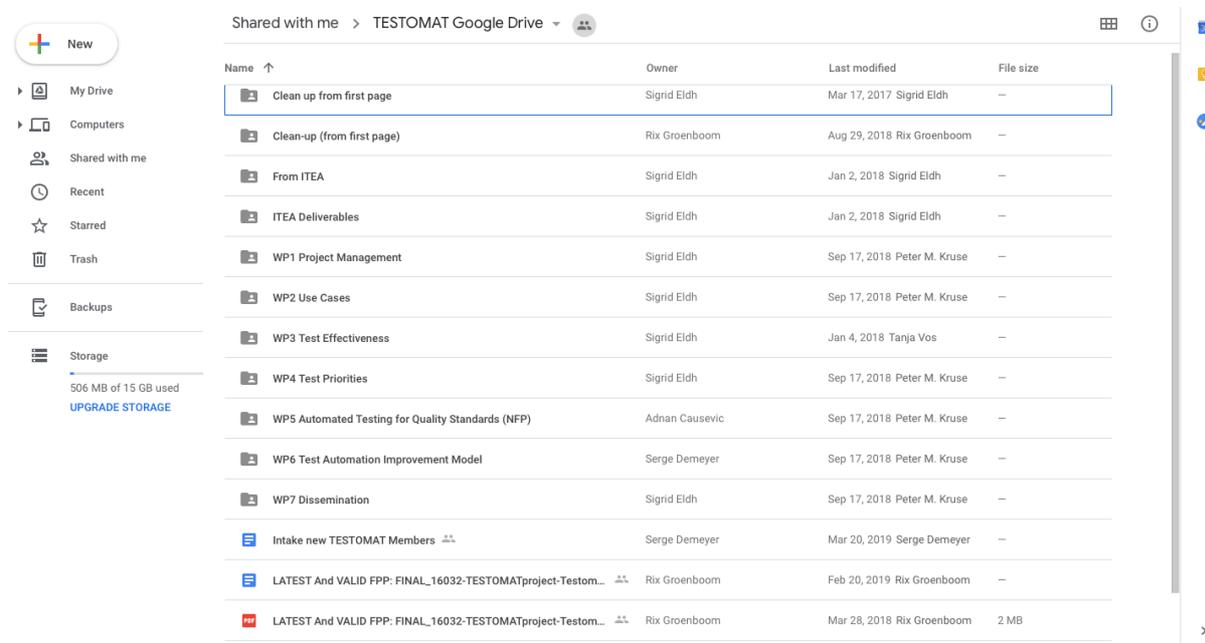


Figure 15. File storage and synchronization service view

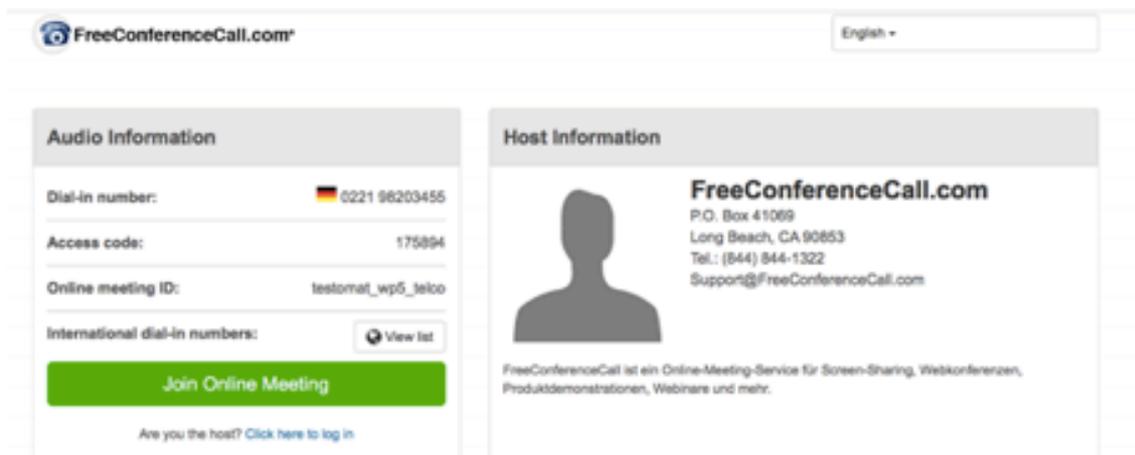
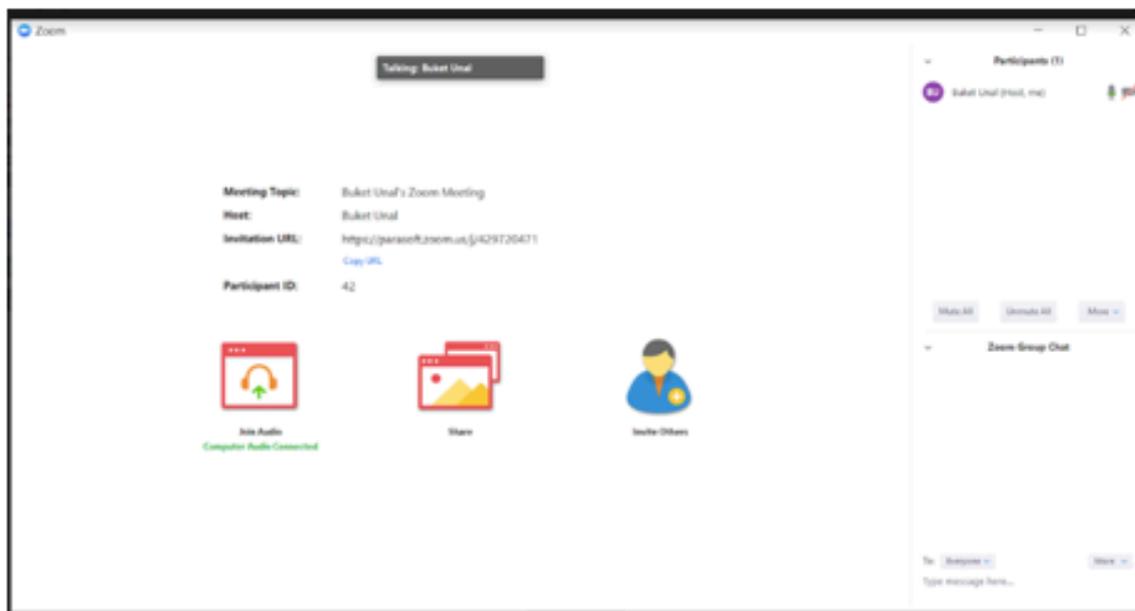
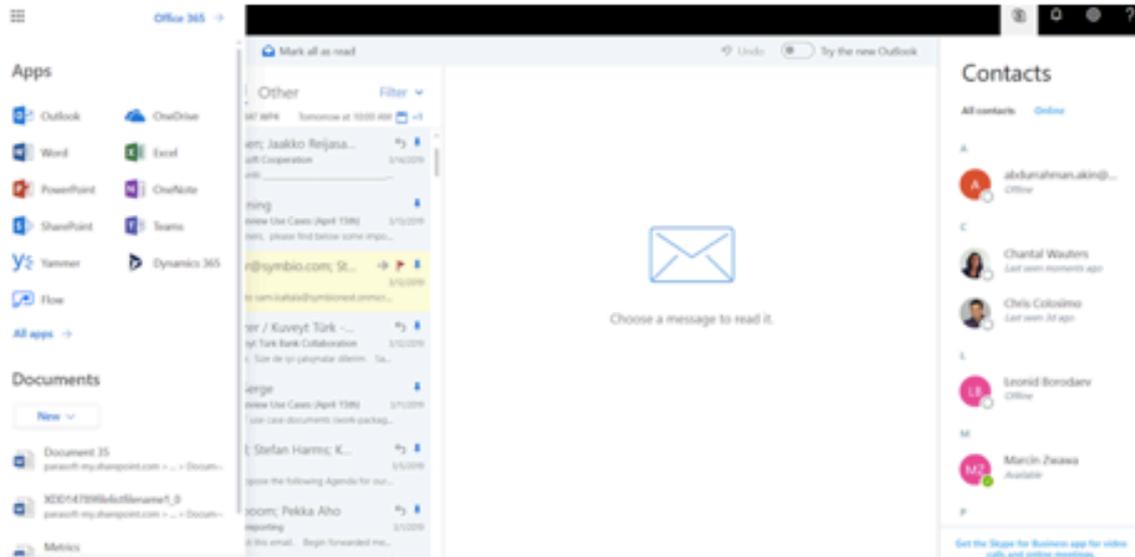
6.2.9 The Right Technology

The right platform is significant in virtual environments in which all members of the team feel most comfortable doing their collaborative work. Usually, a single platform is necessary to

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avoid confusion and assure the content is secure and each team member should easily use it. We are using web-based browser desktop platforms that integrate dashboarding, document sharing, office productivity, and flexibility to integrate new open-source applications. For synchronized audio or video conferencing we are using different software such as Googlemeet, Zoom, Free conference call, slack, etc., with screen sharing for tracking the progress, please see in Figure 16.

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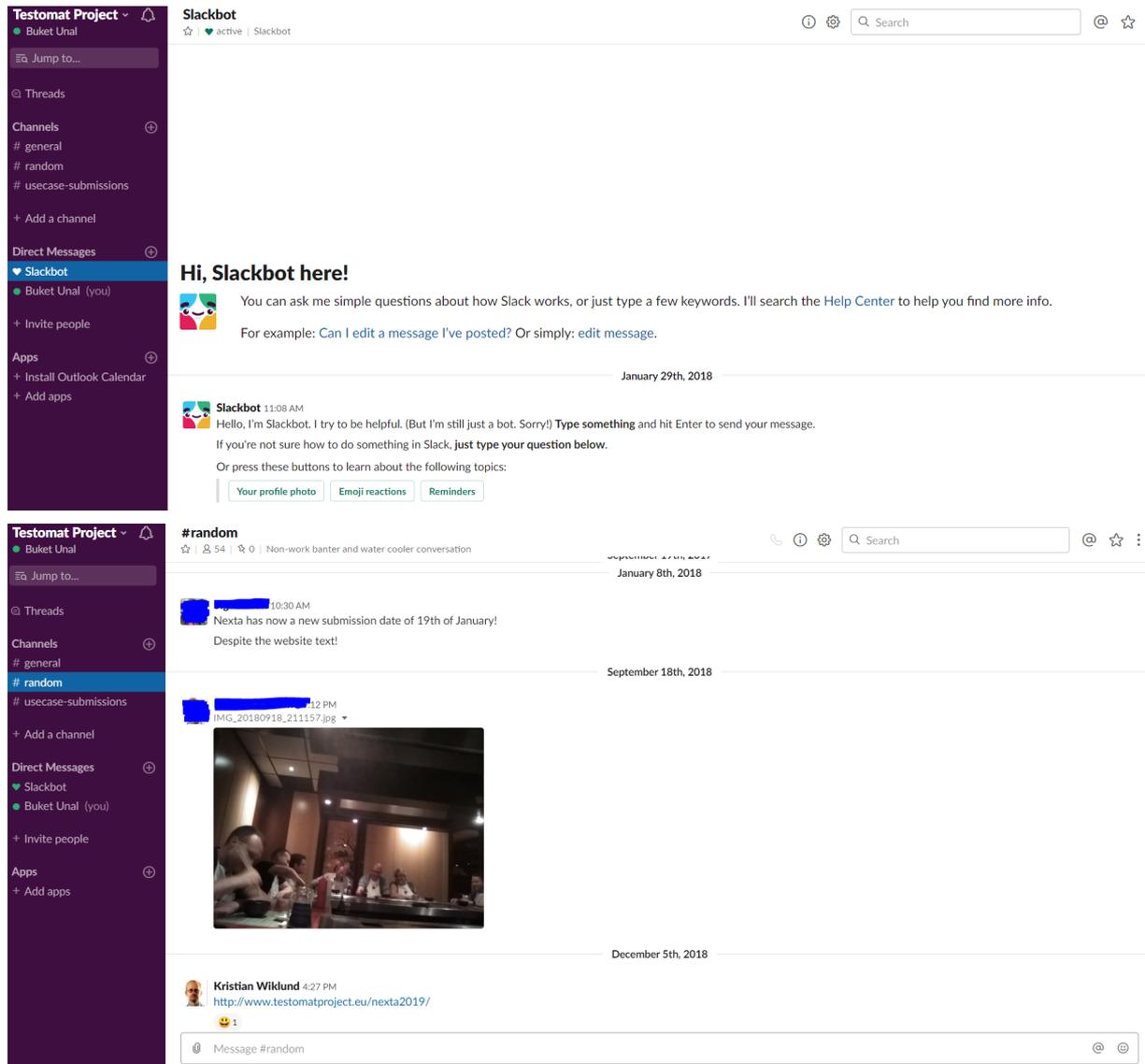


Figure 16. Synchronized communication applications

In addition to synchronous communication tools, we are using Trello boards, lists, and cards which enables us to organize and prioritize our tasks, please see Figure 17.

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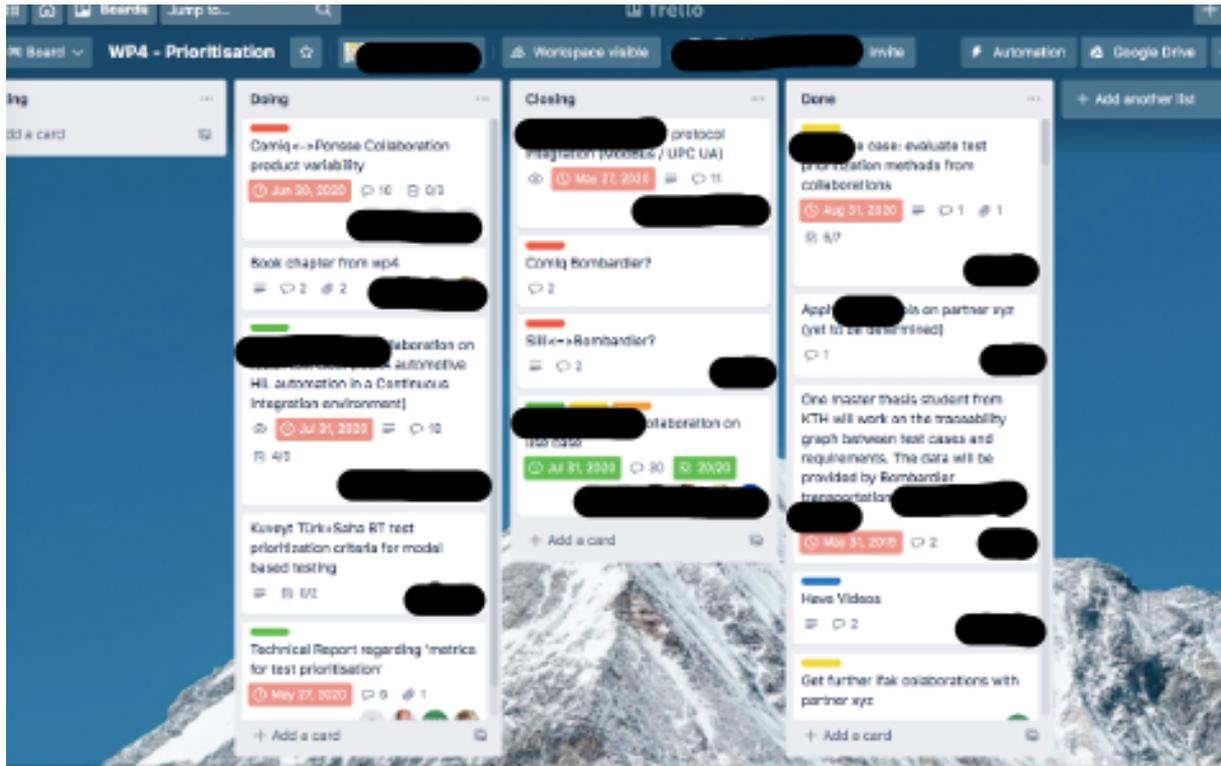


Figure 17. Trello platform

By using Trello cards, it is possible to dive into the details by adding comments, attachments, and due dates of the tasks. We are collaborating on projects from beginning to end by prioritizing the tasks in the Trello platform.

Finally, at the end of each sprint and at the end of the project we have to submit a detailed report to the assessment committee. Therefore, at the end of each sprint, we prepared a state-of-the-art document and added this to the deliverables which are shown in Figure 18.

- Contents
- ITEA3 TESTOMAT Project
- Purpose of the document
- A position on test effectiveness
 - Serge believes this depends on the goal of testing
 - Previous definitions of test effectiveness and related terms
 - Proxy measures of test effectiveness
- Task 1 - Test case overload: Ever-growing maintenance and complex operations
 - Academic State-of-the-Art
 - How Does the TESTOMAT Project Advance State-of-the-Art?
 - Industry Best-in-Class
 - How Do TESTOMAT Partners Redefine Best-in-Class?
 - Gap Analysis: State-of-the-Art versus Best-in-Class
- Task 2 - Test Result Overload: Test Progress, Verdict Visualization, Log analysis, and Quality Assessment
 - Academic State-of-the-Art
 - How Does the TESTOMAT Project Advance State-of-the-Art?
 - Industry Best-in-Class
 - How Do TESTOMAT Partners Redefine Best-in-Class?
 - Gap Analysis: State-of-the-Art versus Best-in-Class
- Task 3 - Test with pay-off: Ensure effective testing by assessing coverage criteria
 - Academic State-of-the-Art
 - How Does the TESTOMAT Project Advance State-of-the-Art?
 - Industry Best-in-Class
 - How Do TESTOMAT Partners Redefine Best-in-Class?
 - Gap Analysis: State-of-the-Art versus Best-in-Class
- Task 4 - Test, evolve and test again: Mutation testing for critical applications
 - Academic State-of-the-Art
 - How Does the TESTOMAT Project Advance State-of-the-Art?
 - Industry Best-in-Class
 - How Do TESTOMAT Partners Redefine Best-in-Class?
 - Gap Analysis: State-of-the-Art versus Best-in-Class
- Task 5 - When less is more: Scriptless testing of graphical user interfaces
 - Academic State-of-the-Art
 - How Does the TESTOMAT Project Advance State-of-the-Art?
 - Industry Best-in-Class
 - How Do TESTOMAT Partners Redefine Best-in-Class?

Figure 18. Example of the state-of-the-art document

In this document, we are defining overall targeted innovations, overall targeted business impacts, overall risks, key performance indicators (KPIs), changes in the technology and business during the reporting period, technical achievements, targets and progress, technical progress per work package, and task, partner’s main contribution, and effort, summarized in Figure 19.

Purpose: Objectives of the project, KPIs, Evaluating work progress, Risk analysis					
People and Roles: What are our roles in the team?	Common Goals: What is our key goal? What do we want to achieve?	Needs and expectations: What needs to be done for the success of the team? What are the targeted business impacts? What are the targeted innovations during the project period?	Rules and Activities: How do we communicate and keep everybody updated? How do we make decisions? How do we calculate KPIs? How do we evaluate the overall project?	Strengths and Assets: What are the skills that we have in the team to achieve our goals? What are the technical achievements?	Weaknesses and Risks: What are the overall risks of the project? What are the obstacles we see ahead or likely to face?

Figure 19. Project evaluation summary (updated/adapted from Team Canvas Basic, 2015)

6.3 Quantitative Research Method

6.3.1 Questionnaires

Purpose of the questionnaire: This questionnaire is part of a research project into the competencies and skills of virtual teams. Specifically, the aim of this research is to investigate what differences there might be in the adequacies and skills of virtual teams compared to the traditional team. Managers and team members who have experience in both virtual and traditional team settings are being to be asked to participate.

Formulating the questionnaire: In my previous company, I was 100% working remotely. Our stakeholders and partners were working remotely. At the same time, a pandemic started, and people were forced into remote work. The pandemic has triggered shifts in how we work, causing many companies to transition from office culture to more flexible ways of working. What works for one company may not work for another; because business needs will vary depending on teams, sector, size and structure. Therefore, this is still open question. Many

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organizations, however, are doing their best to make working more flexible and trying to prevent work-life balance and burnout. As much of the business world moved to a remote work model in 2020, companies tried to ensure their teams had everything they needed to be successful. Now, some companies are going to fully remote work, while others are opting for different visions hybrid work environments but for both, the focus is on optimizing the work from home experience. In this study, my survey focuses on workers' remote work experience. It will provide insight into what benefits and challenges your team is finding while working remotely. Therefore, in the survey, I tried to gather as much information as I could. I formulated the survey with the questions related to critical success factors in virtual teams, communication with other team members, meeting management, decision making and problem-solving, the performance of the virtual teams, and challenges faced by virtual teams.

Questionnaire instructions: This questionnaire should take approximately 10-15 min to complete. Please follow the instructions given in answering the questions.

6.3.2 Methodology

The research presented in this study can be defined as quantitative research. The survey method for data collection is used to test the proposed research model. From the analysis of the data, it could be identified how the effectiveness of coordination mechanisms is impacted by virtual team issues, e.g., distance, time zones, language, culture, trust, and knowledge sharing.

6.3.3 Data Collection Process

The sample frame in this study was mainly acquired from social media websites (e.g., LinkedIn and Facebook) and other web pages (e.g., Survey Circle, Poll Pool, Survey Tandem, SoSci Panel, and Research Gate) where to identify members who work in virtual teams. Also, a sample frame was developed of an individual known to be virtual team members in different industries. Also, some responses were collected from an individual known to be virtual team members. This sample list includes members who fit the description of the study population.

Purposive sampling was used to target individuals who work in virtual settings as well as in traditional teams to make a comparison. The data was collected in two phases. In the first phase, e-mails were sent to group members, and directly to virtual team members seeking their response to the survey. Further, the survey is distributed in the companies between the departments. In the second phase, individuals, pages, and groups were identified which include members and who best fit the population. In both phases, a brief description of the research was given along with a link to access the survey online. A quantitative approach was used to collect

data in an anonymous manner with the use of a survey. Lime Survey which is a web-based survey tool was used to create and host the questionnaire. The survey was open between January 2020- October 2020 and follow-up e-mails were issued over the survey period to all invitees reminding them to complete the survey and reshared in social media websites and the sample was gathered.

6.4 Hypotheses

In this section, the research model is designed along with the research hypotheses, which explain the relationships between knowledge sharing, trust, and their impact on virtual team effectiveness. The theoretical research model is demonstrated in Figure 20.

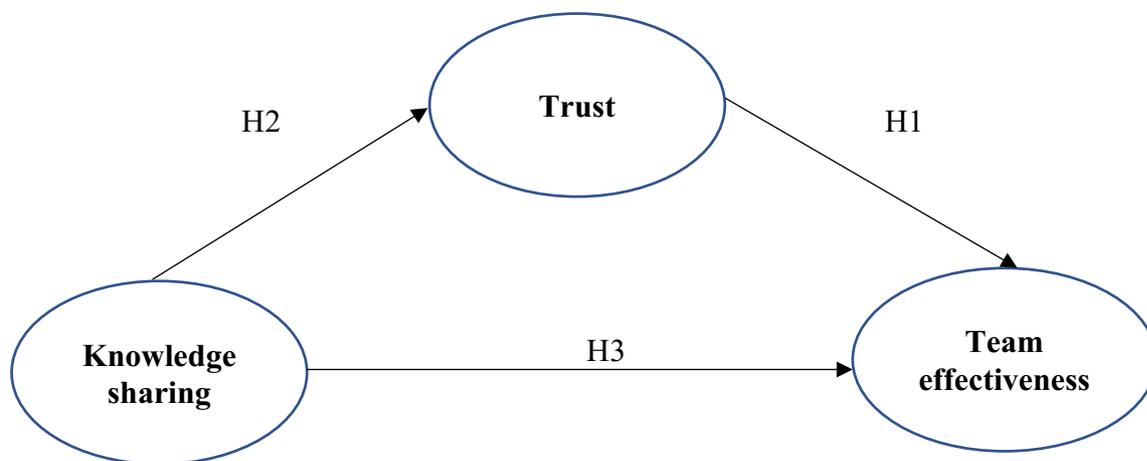


Figure 20. Research model-relationship between trust, knowledge sharing and team effectiveness (adapted from Kiely et al., 2010)

The model represents correlational research in which trust is proposed to positively influence knowledge sharing and team effectiveness.

H1= In virtual teams, trust has a positive impact on team effectiveness among team members.

Trust is the key factor for effective collaboration in virtual teams. Because trust is reducing complexity and enabling a positive atmosphere among virtual teams (Paul and McDaniel, 2004). Theoretically, when a virtual team is newly established trust level is expected to be low among team members. The reason is that virtual team members do not have a past history working together, communicating via information technology, no chance to meet in person therefore, it would be difficult to build trust (Robert et al., 2009). In this stage, team effectiveness is the key factor to support teams building trust among each other. Building trust reduces the risk of collaboration and team members are more likely to work together and more efficiently. Based on this hypothesis, team effectiveness and trust relationship will be argued.

6 Case Study, Research Method and Hypotheses

H2= In virtual team environments, knowledge sharing has a positive impact on trust among team members.

In virtual environments, knowledge sharing is a way of building relationships. Also, it is important to create team structures and rules of interaction for virtual team members. Establishing appropriate expectations would be beneficial to build trust between team members.

H3= In virtual teams, knowledge sharing among team members has a positive impact on team effectiveness.

Virtual teams need to distribute the knowledge adequately among their team members. Otherwise, virtual teams will have impediments or high costs with searching for the necessary knowledge to perform the task (Gray, 2007). Therefore, if virtual teams are able to access knowledge, they perform better and can produce a more effective outcome (Cogliser et al., 2012). With this hypothesis, it will be argued whether or not sharing knowledge has a positive effect on team effectiveness.

Furthermore, team effectiveness can be affected by different virtual team issues which are shown in the figure below. Because virtual teams may have several challenges. These hypotheses are analyzed in this part.

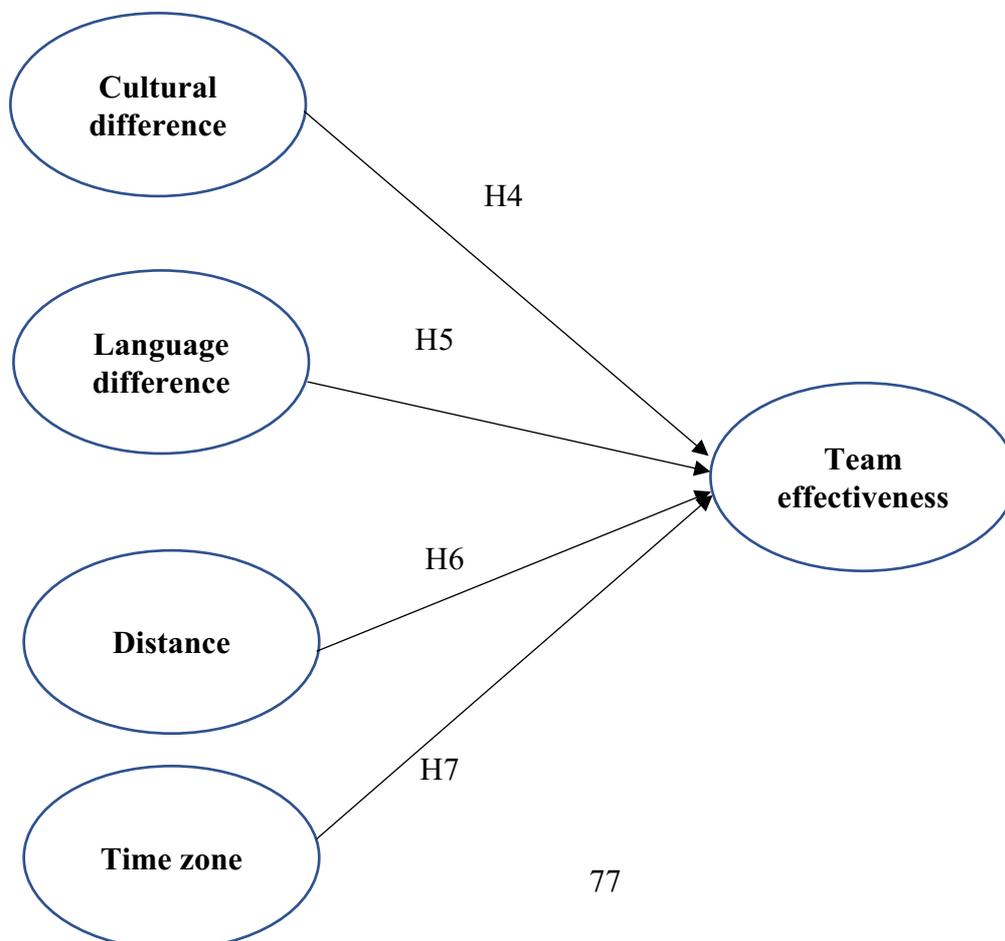


Figure 21. Relationship between virtual team influencing factors and team effectiveness (adapted from Alsharo et al., 2017)

H4= In virtual teams, cultural difference has a negative impact on team effectiveness.

While technology makes global collaboration more accessible and meetings are easier it is not same with the cultural productivity. Culturally based challenges are significant obstacles of effective collaboration. Team effectiveness will be affected by team members who may have a diverse ethnic, national, and organizational backgrounds.

H5= In virtual teams, language difference has a moderately negative impact on team effectiveness.

In virtual teams, difficulties can arise when the virtual team`s working language is not the native language of team members across all project sites.

H6= In virtual teams, distance has a negative impact on team effectiveness.

Difficulties may arise in virtual teams because of the physical separation of team members across geographically dispersed project sites.

H7= In virtual teams, the time difference has a moderately negative impact on team effectiveness.

Project progress will be affected by the time difference between the project sites.

As mentioned in section 6.2 research method, virtual team influencing factors affect the project outcomes and coordination/communication mechanisms. These virtual teams influencing factors (e.g., distance, time zones, language difference, cultural difference, trust) may have an impact on coordination/communication mechanisms (e.g., standards, plans, formal mutual coherence, informal mutual coherence) which is shown in Table 12:

Table 12. Coordination/communication mechanisms and actions (adapted from Kiely et al., 2010)

Standards	<ul style="list-style-type: none"> • Team members follow defined project progress. • Team members use templates to create documentation during the project period. • Team members use guidelines for the project development process.
Plans	<ul style="list-style-type: none"> • Team members create the project plan. • The team leaders and members calculate project estimations. • The team leaders and members define the requirements of the project.
Formal mutual coherence	<ul style="list-style-type: none"> • Team members participate scheduled weekly, bi-weekly conference/status calls. • Team members attend face-to-face meetings if any. • Team members share calendars. • Team members send and/or receive emails, phone calls.
Informal mutual coherence	<ul style="list-style-type: none"> • Team members send and/or receive personal emails, instant messages, phone calls from other team members. • Team members meet face-to-face at local project sites with other team members.

In conclusion, with this case study, we try to refine our theoretical proposals, with accompanying hypotheses. We can therefore continue building specifying hypotheses and thus, we propose the following hypotheses:

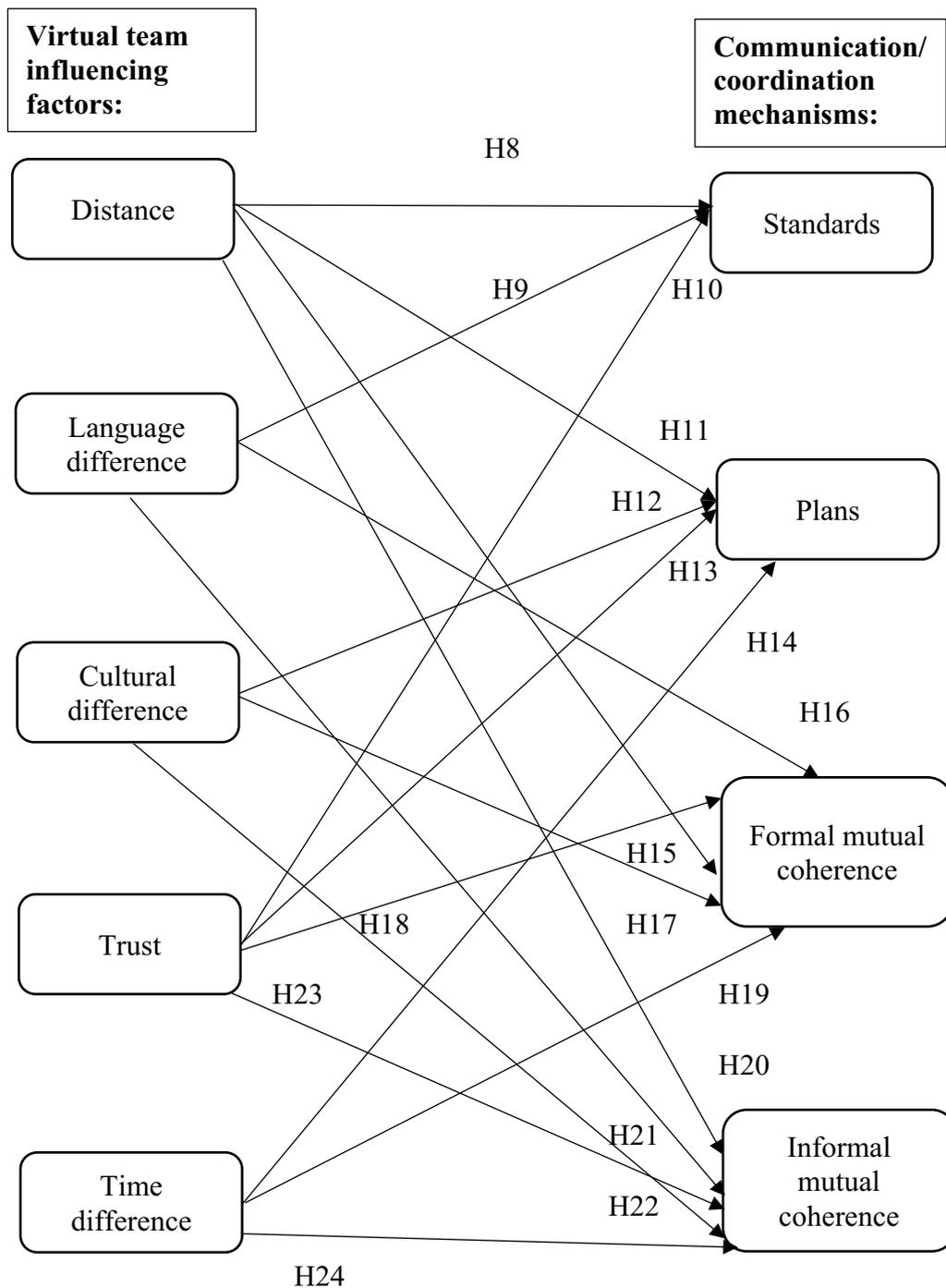


Figure 22. Relationship between virtual team influencing factors and coordination/communication mechanisms (adapted from Kiely et al., 2010)

The conceptual model proposes that the effectiveness of standards is affected by distance, language difference, and trust. According to the literature survey, language difference has an effect on the use of project documentation. In projects, all documents need to be understood by all team members whose native language is different than each other. Therefore, for the effectiveness of standards language difference is an important factor. Distance also has an effect

6 Case Study, Research Method and Hypotheses

on standards because in different regions different kinds of standards may be used according to the project and tasks. Moreover, team members cannot build trust easily while they are geographically dispersed. This decreases the confidence of the team members and thus affects the collaboration. Hence, we propose the following hypotheses:

H8= Distance has a moderately negative effect on the effectiveness of standards.

H9= Language difference has a moderately negative effect on the effectiveness of standards.

H10= Trust has a moderately positive effect on the effectiveness of standards.

Plans are affected by distance, cultural difference, trust, and time difference. While scheduling the project, project estimations may be required from each team who is at a different location. This could affect the effectiveness of plans. In addition to this, cultural difference is another factor that affects the plans. Different cultural backgrounds may have different work disciplines which affect the plans. The time difference has a significant impact on plans because for instance, in some cases problems need to be done quickly and the tasks are dependent on team members at different locations. If those locations have a holiday period, which is usually the case, the tasks cannot be finished on time. Trust has an impact on plans. In the beginning, it could be difficult to trust any team member in a virtual environment but after building trust the progress will be efficient in terms of collaboration between the project members and organizations. We propose the following hypotheses:

H11= Distance has a moderately negative effect on the effectiveness of plans.

H12= Cultural difference has a moderately negative effect on the effectiveness of plans.

H13= Trust has a moderately positive effect on the effectiveness of plans.

H14= Time difference has a moderately negative effect on the effectiveness of plans.

The effectiveness of formal mutual coherence may have been affected by trust, language difference, cultural difference, time difference, and distance. For instance, the distance may affect the formal mutual coherence because of the geographical distribution of team members. Sometimes during the conference calls, team members are very silent, or they cannot focus on their tasks because of the frequent conference calls. The time difference is another significant factor in formal mutual coherence. Because based on the project sites, the meeting could be very early in the morning for one team member and it could be a late-night meeting for another team member. In terms of these working hours, team members cannot perform their tasks efficiently. Language differences could be a problem for formal mutual coherence in virtual

teams. Misunderstandings and communication problems may arise. In addition to this, communication problems can arise due to geographical location and cultural differences. Accent pronunciation makes it difficult to understand each other. The cultural difference also affects formal mutual coherence because some team members do not give any feedback and just listen during the conference calls. In contrast, some team members always speak, and they do not let others speak. Lastly, trust is an important factor in formal mutual coherence. Once trust is established team members can contact each other in a timely fashion. But without face-to-face interaction, it is difficult to build trust. The following hypotheses are proposed:

H15= Distance has a moderately negative effect on formal mutual coherence.

H16= Language difference has a moderately negative effect on the formal mutual coherence.

H17= Cultural difference has a moderately negative effect on the formal mutual coherence.

H18= Trust has a moderately positive effect on formal mutual coherence.

H19= Time difference has a moderately negative effect on the formal mutual coherence.

Finally, informal mutual coherence is affected by language difference, distance, cultural difference, time difference, and trust. For instance, the distance may affect the informal mutual coherence since team members cannot have face-to-face meetings. In contrast, close face-to-face communication provides a better understanding of each other and reduces conference calls, email or instant messages. Time difference and language difference are the factors that reduce opportunities for problem-solving between team members at the same time. Trust has an impact on informal mutual coherence. As indicated previously, until building trust in virtual environments, it is difficult to work remotely but building trust has a positive impact on collaboration. Finally, the cultural difference has an impact on informal mutual coherence. For instance, team members in some locations behave differently in their interactions which affects the informal mutual coherence. We propose the following hypotheses:

H20= Distance has a moderately negative effect on informal mutual coherence.

H21= Language difference has a moderately negative effect on informal mutual coherence.

H22= Cultural difference has a moderately negative effect on informal mutual coherence.

H23= Trust has a moderately positive effect on informal mutual coherence.

H24= Time difference has a moderately negative effect on informal mutual coherence.

6 Case Study, Research Method and Hypotheses

Consequently, virtual teams are faced with several challenges. Virtual team members must learn and understand how to improve their productivity by eliminating the challenges. Virtual teams tend to take a longer time to reach a common goal and work effectively. However, virtual team members tend to express their opinions freely and openly regardless of managerial constraints (Alsharo, 2013). An effective virtual team delivers high task performance with an effective leader in terms of work experience, task load, communication, strong conflict management skills (Peters and Manz, 2008). In this section, we focused on coordination/communication mechanisms and the constructs of distance, cultural difference, language difference, trust, and time difference. Constructs and their relationships are defined, and hypotheses are specified.

6.5 Summary

A set of hypotheses are derived in this chapter. According to the hypotheses team effectiveness, standards, plans, formal mutual coherence, and informal mutual coherence are impacted by trust, knowledge sharing, distance, language difference, cultural difference, and time zone which is shown in Figure 23. It is assumed that these virtual team issues impact project outcomes. These constructs have negative and positive impacts on virtual teams' efficiency. The general idea is that all these constructs impact the team, and project and team communication is the key indicator to produce successful project outcomes. Therefore, in the next chapter, the impacts of these constructs are analyzed, and the results are presented.

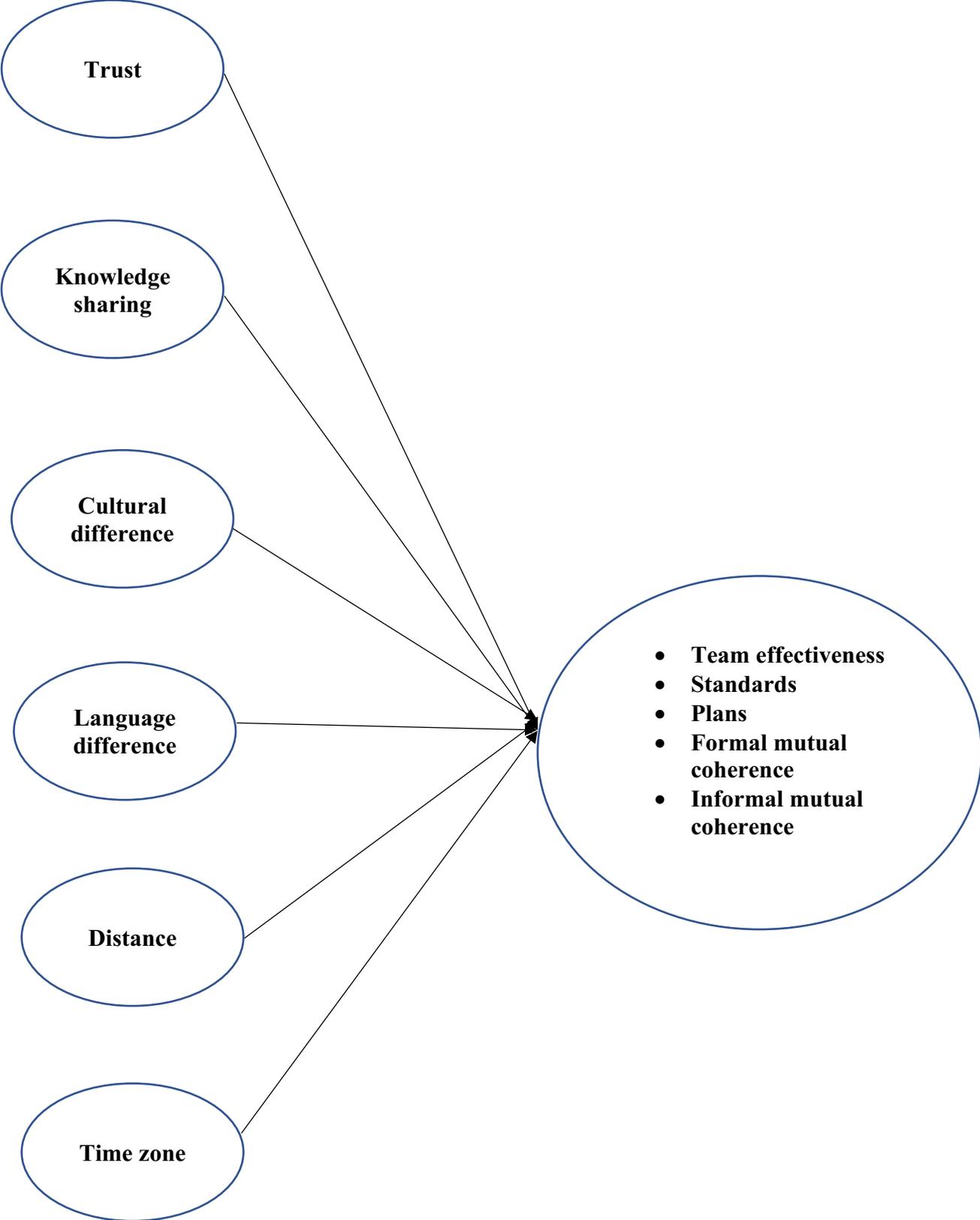


Figure 23. Assumed impacts of virtual team issues on coordination mechanisms

7 Data Analysis

This chapter gives an overview of the survey response and analyzes the questions used in the survey. Data analysis includes demographics and descriptive analysis. The data is then tested for reliability using Cronbach's alpha. A total of 712 participants participated in the survey and 295 responses are partially completed. Therefore, partially completed responses are discarded and 417 responses are considered acceptable.

7.1 Demographic and Descriptive Statistics

Respondents were asked to indicate their gender, age, an industry sector that their work, size of the organization, and the country, and a number of questions concerning factors that can impact virtual team effectiveness. These factors are 1) if they participated in a virtual environment, or in a face-to-face environment or in both virtual and face-to-face environments, 2) what their role in the team is and if they work for the same organization and the location, 3) numbers of years' experience, 4) the number of the members in the team, 5) expected life term of the virtual team, 6) time spent working virtually, 7) the structure of the virtual team distribution, and 8) form of communication between team members. The results of demographics and descriptive statistics are illustrated in Appendix 1.

7.1.1 Respondents' Characteristics

In this section, more detailed information is given regarding the demographic data of respondents. Appendix 2 shows the information about respondents' age, the industry they work in, their nationality, role, experience in a virtual team, size of their team, expected life term of the virtual team, and time spent working virtually.

According to the results, the majority of participants were 81.06% from 34 and under years, 24.70% of participants were German and 25.66% of participants were English. The survey is spread on the internet from different social media channels therefore the participants were not only from Europe also from all over the world (e.g., Australia, Canada, Russia, United States, Israel, Taiwan, Mexico, Malaysia, Pakistan, India, China, United Arab Emirates, Ethiopia, Ireland, Latvia, Japan, Portugal, Hungary, Poland, Thailand, Lebanon, Greece, Cyprus, Philippines, Indonesia, etc.). But the majority of the participants were from Europe. In this research, the scope is for IT projects/industries (because I was working on an IT project as a project manager) that's why the majority of the participants were from the IT industry, e.g., software engineers, solution architects, IT specialists.

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In March 2020, companies suggested employees work from home as a result of the pandemic. At first, people thought that it would last a short time but one year later, people are still working remotely. The pandemic has forced the global workforce to go through a remote work experiment and a lot has changed during the pandemic. Many companies succeeded in working remotely during the pandemic. Some companies plan to go on 100% remote post-pandemic, while others will take a hybrid approach, giving employees more flexibility about where they want to work, and of course, some companies will go on as before, want everyone in the office. The survey in this research was done during the pandemic. According to the survey results, around 40.0% of participants were working between 1-5 years in a virtual working environment and around 48.15% of participants have less than 1-year work experience in virtual teams. Results show that because of the pandemic, many people were working in a virtual environment. Further, the expected life term of working remotely was very high between 6 months - 1-year range and the time spent working virtually was 30.86%. So, the results showed that many employees around the world had been working remotely due to COVID-19 and as a result of the circumstances, many of these employees identify as remote workers now.

7.2 Mean, Standard Deviation and Cronbach's Alpha

The mean, standard deviation, and Cronbach's alpha coefficients are calculated for Likert scale questions. Cronbach's alpha coefficient assesses the internal consistency of the items of each question and estimates the reliability of the items from the responses to the questions (Thomas, 2014). Indicator reliability is described as follows: fair (.45 - .54), good (.55 - .62), very good (.63 - .70), and excellent (.71 and higher) (Alsharo, 2013). Mean, standard deviation, and Cronbach's alpha values for the constructs in the model are illustrated in Appendix 3 and Appendix 4 for both traditional team and virtual team questions.

7.2.1 Reliability Statistics and Correlation Analysis

Cronbach's alpha coefficients are calculated, and the rule is that the alpha value should be greater than 0.7. This is supported by the survey responses with the alpha values ranging from 0.78 to 0.83 for traditional teams' questions and from 0.83 to 0.90 for virtual teams' questions. Cronbach's alpha values for the constructs are illustrated in Table 13 and Table 14 and all constructs show high and adequate alpha values for both traditional and virtual teams' questions.

Table 13. Reliability Statistics for Traditional Teams' Questions

Construct	Cronbach's alpha
Decision making and problem-solving	.80
Performance	.78
Communication	.83
Purpose, goals, and roles	.83

Table 14. Reliability Statistics for Virtual Teams' Questions

Construct	Cronbach's alpha
Communication	.86
Meeting management	.83
Decision making and problem-solving	.85
Performance	.90
Working together to review documents	.87
Challenges	.90

Correlation analysis is used to determine the interrelationships between variables both in virtual team and traditional team questions. Spearman's rank-order correlation is the nonparametric correlation. Spearman's correlation coefficient, (ρ) measures the strength and direction of two ranked variables. Pearson correlation is using the following guide for the absolute value of ρ :

- .00-.19 - very weak
- .20-.39 - weak
- .40-.59 - moderate
- .60-.79 - strong
- .80-1.0 - very strong (taken from

<https://www.statstutor.ac.uk/resources/uploaded/spearmans.pdf>)

The findings show that most variables are significantly related to other variables by applying Spearman's correlation coefficient. Correlation tables are shown in Appendix from 5 to 14 with the explanations for both traditional and virtual team questions.

7.3 Research Findings

In this section, additional questions and results are described to produce and support hypotheses. Questions emphasize the understanding of data for traditional and virtual team issues and practices. Hypotheses results will be presented in the next section (7.4).

7.3.1 One-Sample Kolmogorov-Smirnov Normal Test (Traditional Teams)

This section defines the findings of the study for traditional teams. From the analysis of the data, it was possible to identify the factors that affect traditional team issues (purpose, goals

and roles, communication, decision making and problem-solving, performance and challenges) which are defined below. The results are shown in detail in Appendix 15.

1. Purpose, goals and roles according to the traditional teams

- Team members have a shared purpose. → **Supported**
- Team members have unique skills to do their jobs effectively. → **Supported**
- Team members set and meet the goals of the project. → **Supported**
- Team members produce efficient results. → **Supported**
- The mission and goals of the team are well aligned with the organization's mission. → **Supported**
- Team members understand one another's roles. → **Supported**
- Overlapping tasks are no problem for team members. → **Supported**

2. Communication with other team members in traditional teams

- Team members are effective listeners. → **Supported**
- Communication is transparent between team members. → **Supported**
- Team members trust each other. → **Supported**
- Team members show high levels of cooperation and mutual support to each other. → **Supported**
- Team members established supportive relationships with other teams. → **Supported**

3. Decision making and problem solving according to the traditional teams

- Team members take initiative to solve the problems without the team leader. → **Supported**
- Team leader and team members give each other constructive feedback. → **Supported**
- Team members can resolve differences in ways of doing business. → **Supported**
- Team members work with a great deal of flexibility so changing can be adapted easily. → **Supported**
- Team members arrange their priorities to meet the needs of the project. → **Supported**
- Team members focus on big picture strategic issues of the project. → **Supported**

4. Performance of traditional teams

- Team members are continually working to improve the success factors and key performance indicators. → **Supported**
- Group meetings are very efficient and productive. → **Neutral**

7 Data Analysis

- Team members are rewarded in the team. → **Neutral**
- Team members use different tools/techniques to keep their skills up to date. → **Supported**
- Development opportunities are provided to team members. → **Supported**

5. Please add any other issues related to traditional teamwork challenges which are not included in this survey. These are the comments from the participants:

- “Team members have to be socialized with each other within a limited boundary”.
- “Diverse background of team members”.
- “Some companies have their own culture in traditional terms. I think that is a challenge as well”.
- “It really depends on the type of person we work with. Sometimes it is hard to work with a friend or someone you have a close relationship with as they kind of take things for granted and expected so much in return. I tried not to depend on them that much, so I started doing work or initiating a project on my own. I like to work in a team but in order to have a successful outcome, I need to choose the people, or I end up doing most work as for a reason a 'team leader' should do the most. I really think this is unfair”.
- “Possible organization issues/time management”.
- “Some managers are rude and not approachable”.
- “Diversity and inclusion are not really taken into account in my traditional team”.
- “Time management is also an issue as it is difficult to handle large teams”.
- “One big issue is that most people can't look at their contributions/ideas neutral and tend to put more value on their own ideas, even if the team consensus the idea is bad”.

7.3.2 One-Sample Kolmogorov-Smirnov Normal Test (Virtual Teams)

This section defines the findings of the study for virtual teams. From the analysis of the data, it was possible to identify the factors that affect virtual team issues (critical success factors, communication, meeting management, decision making and problem-solving, performance, working together, and challenges) which are defined below. The results are shown in detail in Appendix 16.

1. Critical Success Factors in Virtual Teams

- In virtual teams, the cultural difference has a positive/negative impact on team effectiveness. => **Moderately positive effect**

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- In virtual teams, language difference has a positive/negative impact on team effectiveness. => **Moderately negative effect**
- In virtual teams, distance has a positive/negative impact on team effectiveness. => **No effect**
- In virtual teams, the time difference has a positive/negative impact on team effectiveness. => **Moderately negative effect**
- Meeting face-to-face has a positive/negative impact on communication and team effectiveness. => **High positive effect**
- In virtual team environments, leadership has an impact on team effectiveness. => **Moderately positive effect**
- In virtual teams, knowledge sharing among team members has a positive/negative impact on team effectiveness. => **High positive effect**
- In virtual team environments, knowledge sharing has a positive/negative impact on trust among team members. => **High positive effect**
- In virtual teams, effective leadership has a positive/negative impact on trust among team members. => **High positive effect**
- Good access to technical training has a positive/negative impact on team effectiveness. => **Moderately positive effect**
- The culture supports shared ways of doing business across teams and organizations thus, has a positive/negative impact on team effectiveness. => **Moderately positive effect**
- High trust between organizations and team members has a positive/negative impact on team effectiveness. => **High positive effect**
- Team members' experience in working across boundaries has a positive/negative impact on team effectiveness. => **Moderately positive effect**
- The skills of the project manager/leader have a positive/negative impact on the performance of the virtual team. => **High positive effect**

2. Communication with other team members in virtual environments

- Check your email every day and respond within 24/48 hours. => **Very important**
- Check your voice mail every day and return within 24 hours. => **Very important**
- Exchange documents using Google Drive. => **Very important**
- Attend all mandatory meetings. => **Very important**
- If you cannot join the meeting let other people know. => **Very important**

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- There are appropriate standards for electronic communication and tools across organizations. => **Very important**
- People from all functional and geographical areas have equal access and are skilled in using electronic communication and technology. => **Very important**

3. Meeting management in terms of virtual environments

- Be on time for video conferences, audio conferences, and other meetings. => **Very important**
- Rotate time zones for meetings. => **Fairly important**
- In video conferences or audio conferences, keep mute when not speaking. => **Very important**
- Do not interrupt others during the meetings. => **Very important**
- An agenda is sent out via email 24 hours in advance of every meeting and minutes are sent out via email 24 hours after the meeting. => **Fairly important**
- Respect the agenda. => **Very important**

4. Decision making and problem solving in terms of virtual environments

- Keep the interests and goals of the team at the top of all decisions. => **Fairly important**
- Balance the local interests of team members with the entire team. => **Fairly important**
- If you need support, first contact the team member who is responsible from the project. => **Fairly important**
- Resolve differences in ways of doing business. => **Fairly important**
- Use an established conflict management process. => **Fairly important**
- Do not solve the problems by using email. Use the telephone and speak directly with the person, not with the team leader. => **Fairly important**
- Recognize that conflict is more difficult to solve in a virtual environment therefore do not let tensions build. => **Fairly important**

5. Performance of the virtual teams

- The output of the project/work which the team produces is... => **Exceeds expectations**
- The quality of the work is... => **Meet expectations**
- The effectiveness of the team`s interactions is... => **Meet expectations**
- The team`s ability to meet the deadlines is... => **Exceeds expectations**
- The team`s ability to meet the project budget is... => **Exceeds expectations**
- The team`s ability to meet the goals of the project is... => **Exceeds expectations**

6. Working together to review documents in virtual environments

- Review/assess long document details except audio or video conference sessions. => **Important**
- Keep confidential documents within the team. => **Very important**
- While working sequentially, give feedback on time. => **Very important**
- Review the team's and project progress weekly or bi-weekly via audio/video conference. => **Fairly important**
- There are mechanisms for sharing knowledge across boundaries. => **Fairly important**
- Working in a virtual environment requires a specific skill. => **Fairly important**
- Creating a sense of ownership of the project/goals is important for virtual teams. => **Fairly important**
- Leaders have skills such as working across boundaries and using technology effectively. => **Fairly important**

7. Challenges faced by virtual teams

- Managing conflict. => **Very challenging**
- Establishing trust and relationship. => **Challenging**
- Having an effective communication. => **Very challenging**
- Time zones. => **Challenging**
- Partners/members who do not participate meetings. => **Very challenging**
- Misunderstandings due to differences in culture, language, etc. => **Very challenging**
- Meeting deadlines. => **Challenging**
- Loss of productivity due to the IT problems. => **Challenging**
- Presenting ideas during meetings. => **Challenging**
- Adhering to agenda. => **Challenging**
- Difficulty in leading teams remotely. => **Challenging**
- Technical and/or cost issues. => **Challenging**
- Difficulty managing team members' productivity. => **Challenging**

8. Please add any other issues related to virtual teams and virtual teamwork challenges which are not included in this survey.

This is an open-ended question and the responses from the participants are shown below:

- “Technical problems on equipment like machinery or tools”.
- “Keeping the motivation at the highest level is a real challenge”.

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- “Programming procedures and policies”.
- “Work prioritization has become more challenging as well as time management as the number of virtual meetings has increased”.
- “I think everything is included”.
- “Being late for a meeting with people in different time zones”.
- “Communication with C-level staff”.
- “If most work is indeed done virtually individuals' physical health and well-being can decrease. This can be prevented with a proper diet, some physical exercise, some social interactions, and a decent work-life balance”.
- “I generally feel like remote group work has significantly dropped the quality of group work as compared to the face-to-face environment”.
- “Due to the inability to timely capture partners' facial expressions and body movements, communication is prone to misunderstandings”.
- “Internet speed”.
- “Keeping a balance between formal and informal part”.
- “I think you've summed it up quite well. The only thing I would like to add is that it can be difficult to build interpersonal relationships outside of work, so the social aspect often lacks in virtual teams”.
- “Equipment failure or poor connectivity during busy times”.
- “Sharing tasks equally across group members. Other members pick up the slack for those who seem less in tune with the project. Other issues include inter-organization trust of the leading university to team members of other universities. Not the team member from the leading university but the access the university itself allows”.
- “I just think that effective communication (which is enumerated in the list) is the greatest problem and has layers and way in which it manifests itself”.
- “The communication is derived from the nonverbal cues, which are very important in an efficient decision-making process”.
- “People with anxiety might prefer using mails instead of video or audio calls”.
- “Unstable net having a set time all members are available if needing a video meeting. In the unfortunate event of laptop or PC breaking down and not working, therefore cause a loss of work that was previously completed”.
- “Sometimes people will not engage in an online space as much as they would face-to-face”.

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- “Differences in systems and difficulties in recruiting people locally with the appropriate skills”.
- “I think all the possible challenges are discussed in this survey”.
- “Perpetuate the feeling of community and camaraderie in the company”.
- “Select proper leadership who already have the skills to manage remote teams or to train them how to manage virtual teams. This does not come naturally to people. Trust is extremely important in virtual teams and for managers who only worked with co-located teams, it is very difficult to get into a knowledge-driven culture, where command and control is not always (or almost never) the right approach”.

7.4 Hypotheses Results

This section defines the hypotheses posed for this study as well as the statistical methods used to evaluate them.

7.4.1 Hypotheses Analysis between H1-H7

H1= In virtual teams, trust has a positive impact on team effectiveness among team members.

To indicate the relationship between trust and team effectiveness Chi-square test was conducted. The sample included 417 respondents. The association between the variables is statistically significant if Asymptotic significance (2-sided) < 0.05 which is the case here. It is the probability of observing our sample outcome if the variables are independent in the entire population. In H1, an association between trust and team effectiveness was observed, $X^2 = (5, N=417) = 336.482, p = 0.00$. And the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. The variables are associated with each other and trust has a high positive impact on team effectiveness.

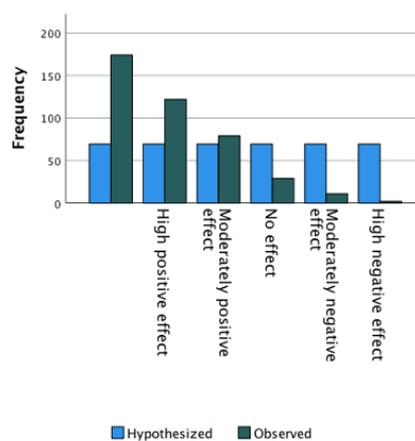


Figure 24. Trust and team effectiveness relationship

❖ Different cases for Hypothesis 1 and Challenges

➤ Role:

Trust is compared with the roles of the participants and the frequencies of participants did not differ by their role, H1- Project Leader/Coordinator: $X^2(4, N = 243) = 4.612, p = .330$, H1 – Project Manager: $X^2(4, N = 243) = 7.445, p = .114$, H1 – Team Member: $X^2(4, N = 243) = 1.990, p = .738$, H1 – Researcher: $X^2(4, N = 243) = 5.464, p = .243$. Graphs are shown in Appendix 17.

Comparing the Challenges with Hypothesis 1:

Graphs are shown in Appendix 18 with the explanations. Challenges (e.g., establishing trust and relationship, managing conflict, having effective communication, difficulty in leading teams remotely, difficulty managing team members' productivity) are compared with hypothesis 1.

Establishing trust and relationship

There was no significant difference between trust and establishing trust and relationship, $X^2(16, N = 243) = 23.777, p = .094$, suggesting that establishing trust and relationship can impact virtual team effectiveness positively since it was found extremely challenging (62.7%).

Managing Conflict

There was no significant difference between trust and managing conflict, $X^2(16, N = 243) = 19.392, p = .249$, and managing conflict was found very challenging (48.1%).

Having an Effective Communication

There was no significant difference between trust and effective communication, $X^2(16, N = 243) = 18.747, p = .282$, and effective communication was found extremely challenging (68.0%).

Difficulty in Leading Teams Remotely

There was a significant difference between trust and leading teams remotely, $X^2(16, N = 243) = 33.499, p = .006$, and leading teams remotely was found challenging (43.4%)

Difficulty Managing Team Members' Productivity

There was no significant difference between trust and difficulty managing team members' productivity, $X^2(16, N = 243) = 25.480, p = .062$, and managing team members' productivity was found challenging (41.3%).

H2= In virtual team environments, knowledge sharing has a positive impact on trust among team members.

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The sample included 417 respondents. In H2, an association between knowledge sharing and trust was observed $X^2 = (5, N=417) = 304.683, p = 0.00$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. The variables are associated with each other and knowledge sharing has a high positive impact on trust among team members.

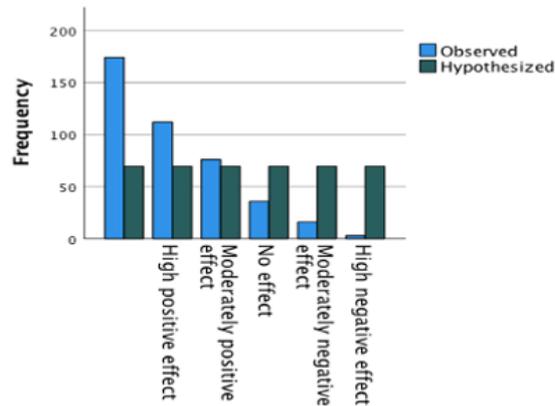


Figure 25. Knowledge sharing and trust relationship among team members

❖ Different cases for Hypothesis 2 and Challenges

➤ Role:

Knowledge sharing is compared with the roles of the participants and the frequencies of participants did not differ by their role, H2- Project Leader/Coordinator: $X^2(4, N = 243) = 3.614, p = .461$, H2 – Project Manager: $X^2(4, N = 243) = 5.307, p = .257$, H2 – Team Member: $X^2(4, N = 243) = 1.870, p = .760$, H2 – Researcher: $X^2(4, N = 243) = 7.884, p = .096$. Thus, these frequencies were not significantly different and knowledge sharing has a positive impact on trust among team members. Graphs are shown in Appendix 19.

Comparing the Challenges with Hypothesis 2:

Graphs are shown in Appendix 20 with the explanations. Challenges (e.g., establishing trust and relationship, there are mechanisms for sharing knowledge across boundaries, while working sequentially give feedback on time) are compared with hypothesis 2.

Establishing trust and relationship

There was a significant difference between knowledge sharing and establishing trust and relationship, $X^2(16, N = 243) = 27.423, p = .037$, suggesting that knowledge sharing has a positive impact on establishing trust and relationship and it was found extremely challenging (54.9%).

There are mechanisms for sharing knowledge across boundaries

There was a significant difference between knowledge sharing and the mechanisms for sharing knowledge across boundaries, $X^2(16, N = 243) = 36.126, p = .003$, suggesting that knowledge sharing should be considered in virtual environments since it was found extremely challenging (68.1%).

While working sequentially give feedback on time

The relation between knowledge sharing and giving feedback was significant, $X^2(16, N = 243) = 47.277, p = .000$, giving feedback on time was extremely challenging (67.4%).

H3= In virtual teams, knowledge sharing among team members has a positive impact on team effectiveness.

The sample included 417 respondents. In H3, an association between knowledge sharing and team effectiveness was observed $X^2= (5, N=417) = 325.460, p = 0.00$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. The variables are associated with each other and knowledge sharing has a high positive impact on team effectiveness.

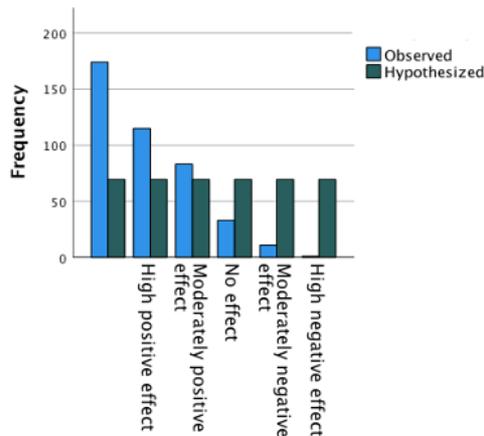


Figure 26. Knowledge sharing and team effectiveness relationship

➤ **Role:**

Knowledge sharing among team members is compared with the roles of the participants and the frequencies of participants did not differ by their role except Project leader/Coordinator, H3 - Project Leader/Coordinator: $X^2(4, N = 243) = 16.813, p = .002$, H3 - Project Manager: $X^2(4, N = 243) = 5.021, p = .285$, H3 - Team Member: $X^2(4, N = 243) = 2.353, p = .671$, H3 - Researcher: $X^2(4, N = 243) = 3.053, p = .548$. Thus, these frequencies were not significantly

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different and knowledge sharing has a positive impact on team effectiveness. Graphs are shown in Appendix 21.

H4= In virtual teams, cultural difference has a negative on team effectiveness.

The sample included 417 respondents. In H4, an association between cultural difference and team effectiveness was observed $X^2(5, N = 417) = 253.144, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. It is expected that cultural difference has a negative effect on team effectiveness, but the results show that the variables are associated with each other and cultural difference has a moderately positive impact on team effectiveness. Therefore, Hypothesis 4 is not supported.

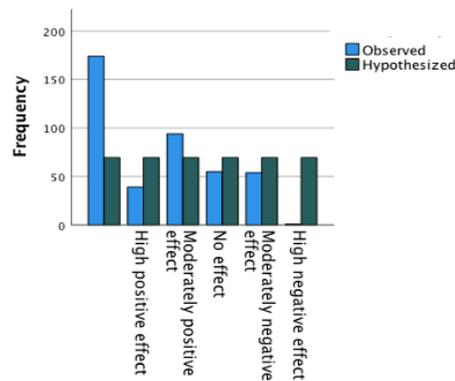


Figure 27. Cultural difference and team effectiveness relationship

Comparing the Challenges with Hypothesis 4:

Graphs are shown in Appendix 22 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having effective communication, misunderstandings due to differences in culture, language, difficulty in leading teams remotely, difficulty managing team members' productivity) are compared with hypothesis 4.

Managing conflict

There was no significant difference between cultural difference and managing conflict, $X^2(16, N = 243) = 22.789, p = .119$, thus, the cultural difference has a positive impact on team effectiveness, and managing conflict was found challenging (48.8%).

Establishing trust and relationship

Frequencies were not significantly different between cultural difference and establishing trust and relationship, $X^2(16, N = 243) = 23.230, p = .108$, thus, the cultural difference has a positive impact on team effectiveness, and managing conflict was found somewhat challenging (58.1%).

Having an effective communication

Frequencies were not significantly different between cultural difference and having effective communication, $X^2(16, N = 243) = 14.769, p = .542$, thus, the cultural difference has a positive impact on team effectiveness, and having effective communication was found challenging (38.8%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between cultural differences and misunderstandings due to differences, $X^2(16, N = 243) = 15.957, p = .456$, and misunderstandings due to differences were found very challenging (42.3%).

Difficulty in leading teams remotely

Frequencies were not significantly different between cultural difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 22.703, p = .122$, and difficulty in leading teams remotely was found challenging (39.5%).

Difficulty managing team members' productivity

Frequencies were not significantly different between cultural difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 9.747, p = .879$, and difficulty managing team members' productivity was found challenging (37.5%).

H5= In virtual teams, language difference has a moderately negative impact on team effectiveness.

The sample included 417 respondents. In H5, an association between language difference and team effectiveness was observed $X^2(5, N = 417) = 298.295, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. The variables are associated with each other and language difference has a moderately negative impact on team effectiveness.

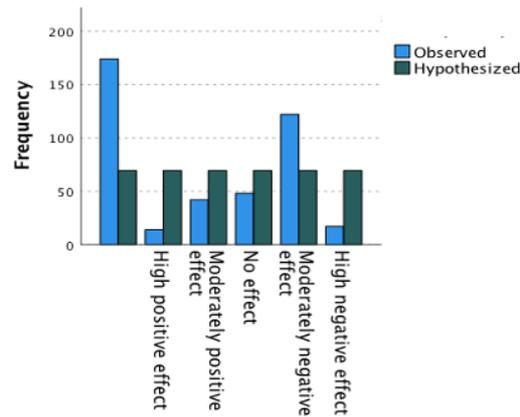


Figure 28. Language difference and team effectiveness relationship

❖ Different cases for H5 and Challenges

➤ You are in the same time zone and working at the same country:

Language differences are compared between the same time zone and same country case. Graphs are shown in Appendix 23 with the explanations.

Virtual team members are speaking the same language and working at the same company

There was no significant difference between the same language, same company cases, and language difference, $X^2(4, N = 123) = 7.047, p = .133$, virtual team members who are speaking the same language and working at the same company rated that language difference has a negative effect on team effectiveness.

Virtual team members are speaking the same language but NOT working at the same company

There was no significant difference between the same language, same company cases and language difference, $X^2(4, N = 123) = 9.352, p = .053$, virtual team members who are speaking the same language and working at different company rated that language difference has a positive effect on team effectiveness.

Virtual team members are NOT speaking the same language and working at the same company

There was no significant difference between the different language, same company cases, and language difference, $X^2(4, N = 123) = 3.821, p = .431$, virtual team members who are speaking different language and working at the same company rated that language difference has a negative effect on team effectiveness.

➤ **You are in the same time zone but NOT in the same country:**

Language differences are compared between the same time zone and different country cases. Graphs are shown in Appendix 24 with the explanations.

Virtual team members are speaking the same language but NOT working at the same company

There was no significant difference between the same language, different company cases, and language difference, $X^2(2, N = 14) = 1.556, p = .459$, virtual team members who are speaking the same language and working at different company rated that language difference has a negative effect on team effectiveness.

Virtual team members are NOT speaking the same language and working at the same company

There was no significant difference between the different language, same company cases, and language difference, $X^2(2, N = 14) = 1.061, p = .588$, virtual team members who are speaking different language and working at the same company rated that language difference has a negative effect on team effectiveness.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was no significant difference between the s different language, different company cases, and language difference, $X^2(2, N = 14) = 1.925, p = .382$, virtual team members who are speaking a different language and working at different company rated that language difference has a negative effect on team effectiveness.

➤ **You are in the same time zone but NOT in the same country:**

Language differences are compared between the same time zone and different country cases. Graphs are shown in Appendix 25 with the explanations.

Virtual team members are speaking the same language and working at the same company

To compare the same language, same company cases, and language difference, a Chi-square test was conducted. There was no significant difference between the same language, same company cases and language difference, $X^2(4, N = 106) = 6.477, p = .166$, virtual team members who are speaking the same language and working at the same company rated that language difference has a negative effect on team effectiveness.

Virtual team members are speaking the same language but NOT working at the same company

To compare the same language, different company cases, and language difference, a Chi-square test was conducted. There was no significant difference between the same language, different company cases, and language difference, $X^2(4, N = 106) = 2.405, p = .662$, virtual team members who are speaking the same language and working at different company rated that language difference has a negative effect on team effectiveness.

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases, and language difference, a Chi-square test was conducted. There was a significant difference between the different language, same company cases and language difference, $X^2(4, N = 106) = 17.431, p = .002$, virtual team members who are speaking different language and working at the same company rated that language difference has no effect on team effectiveness.

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases. and language difference, a Chi-square test was conducted. There was no significant difference between the different language, different company cases and language difference, $X^2(4, N = 106) = 2.198, p = .699$, virtual team members who are speaking different language and working at different company rated that language difference has a negative effect on team effectiveness.

Comparing the Challenges with Hypothesis 5:

Graphs are shown in Appendix 26 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having effective communication, misunderstandings due to differences in culture, language, presenting ideas during meetings, difficulty in leading teams remotely, difficulty managing team members' productivity) are compared with hypothesis 5.

Managing conflict

Frequencies were not significantly different between language difference and managing conflict, $X^2(16, N = 243) = 2.198, p = .055$, and managing conflict was found very challenging (54.3%).

Establishing trust and relationship

Frequencies were not significantly different between language difference and establishing trust and relationship, $X^2(16, N = 243) = 14.512, p = .561$, and establishing trust and relationship was found very challenging (53.2%).

Having an effective communication.

Frequencies were not significantly different between language difference and having an effective communication, $X^2(16, N = 243) = 15.665, p = .477$, and having an effective communication was found challenging (50.7%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between language difference and misunderstandings due to differences, $X^2(16, N = 243) = 17.694, p = .342$, and misunderstandings due to differences was found very challenging (59.0%).

Presenting ideas during meetings

Frequencies were not significantly different between language difference and presenting ideas during meetings, $X^2(16, N = 243) = 21.052, p = .177$, and presenting ideas during meetings was found somewhat challenging (61.5%).

Difficulty in leading teams remotely

Frequencies were not significantly different between language difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 9.630, p = .885$, and difficulty in leading teams remotely was found challenging (46.1%).

Difficulty managing team members' productivity

Frequencies were not significantly different between language difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 16.132, p = .444$, and difficulty managing team members' productivity was found challenging (46.1%).

H6= In virtual teams, distance has a negative impact on team effectiveness.

The sample included 417 respondents. In H6, an association between distance and team effectiveness was observed $X^2(5, N = 417) = 278.353, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. It is expected that distance has a negative effect on team effectiveness. According to the responses the variables are associated with each other and distance has no effect on team effectiveness, thus H6 is not supported.

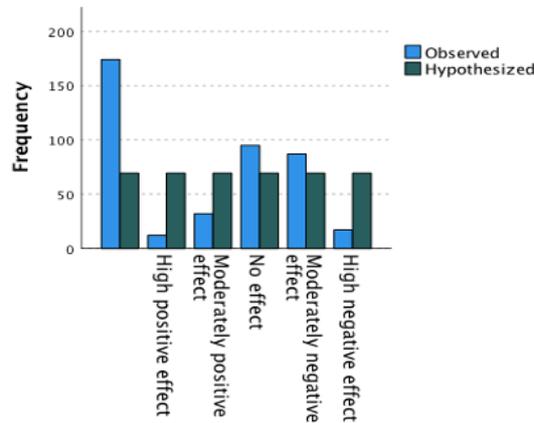


Figure 29. Distance and team effectiveness relationship

❖ Different cases for H6 and Challenges

➤ You are NOT in the same time zone.

Distance is compared between the different time zone case. Graphs are shown in Appendix 27 with the explanations.

Virtual team members are speaking the same language and working at the same company

There was no significant difference between the same language, same company cases and distance, $X^2(4, N = 106) = 3.793, p = .435$, virtual team members who are speaking the same language and working at the same company rated that distance has no effect on team effectiveness.

Virtual team members are speaking the same language but NOT working at the same company

There was no significant difference between the same language, different company cases and distance, $X^2(4, N = 106) = 4.959, p = .292$, virtual team members who are speaking the same language and working at different company rated that distance has no effect on team effectiveness.

Virtual team members are NOT speaking the same language and working at the same company

There was no significant difference between the different language, same company cases and distance, $X^2(4, N = 106) = 4.255, p = .373$, virtual team members who are speaking different language and working at the same company rated that distance has no effect on team effectiveness.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was no significant difference between the different language, different company cases and distance, $X^2(4, N = 106) = 6.567, p = .161$, virtual team members who are speaking different language and working at different company rated that distance has a moderately negative effect on team effectiveness.

The relation between distance and different time zone case were not significant.

➤ **You are in the same time zone but NOT in the same country.**

Distance is compared between the same time zone different country case. Graphs are shown in Appendix 28 with the explanations.

Virtual team members are speaking the same language and working at the same company

There was no significant difference between the same language, same company cases and distance, $X^2(2, N = 14) = .893, p = .640$, virtual team members who are speaking the same language and working at the same company rated that distance has a moderately negative effect on team effectiveness.

Virtual team members are speaking the same language but NOT working at the same company

There was no significant difference between the same language, different company cases and distance, $X^2(2, N = 14) = 1.676, p = .433$, virtual team members who are speaking the same language and working at different company rated that distance has no effect on team effectiveness.

Virtual team members are NOT speaking the same language and working at the same company

There was no significant difference between the different language, same company cases and distance, $X^2(2, N = 14) = .339, p = .844$, virtual team members who are speaking the different language and working at the same company rated that distance has a moderately negative effect on team effectiveness.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was no significant difference between the different language, different company cases and distance, $X^2(2, N = 14) = 2.730, p = .255$, virtual team members who are speaking the

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different language and working at different company rated that distance has a moderately negative effect on team effectiveness.

The relation between distance and same time zone different country cases were not significant.

Comparing the Challenges with Hypothesis 6:

Graphs are shown in Appendix 29 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having an effective communication, time zones, partners/members who do not participate meetings, misunderstandings due to differences in culture, language, meeting deadlines, loss of productivity due to the IT problems, difficulty in leading teams remotely, difficulty managing team members' productivity) are compared with hypothesis 6.

Managing conflict

Frequencies were not significantly different between distance and managing conflict, $X^2(16, N = 243) = 13.031$, $p = .670$, and managing conflict was found very challenging (39.5%).

Establishing trust and relationship

Frequencies were not significantly different between distance and establishing trust and relationship, $X^2(16, N = 243) = 17.658$, $p = .344$, and establishing trust and relationship was found very challenging.

Having an effective communication

The relation between distance and having effective communication were significant, $X^2(16, N = 243) = 31.439$, $p = .012$, and having an effective communication was found challenging.

Time zones

Frequencies were not significantly different between distance and time zones, $X^2(16, N = 243) = 17.616$, $p = .347$, and time zones were found challenging.

Partners/members who do not participate meetings

Frequencies were not significantly different between distance and partners/members who do not participate meetings, $X^2(16, N = 243) = 21.344$, $p = .166$, and partners/members who do not participate meetings were found very challenging.

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between distance and misunderstandings due to differences, $X^2(16, N = 243) = 17.001$, $p = .386$, and misunderstandings due to differences were found very challenging.

Meeting deadlines

Frequencies were not significantly different between distance and meeting deadlines, $X^2(16, N = 243) = 19.571$, $p = .240$, and meeting deadlines were found challenging.

Loss of productivity due to the IT problems

Frequencies were not significantly different between distance and loss of productivity due to the IT problems, $X^2(16, N = 243) = 14.171, p = .586$, and loss of productivity due to the IT problems were found challenging.

Difficulty in leading teams remotely

Frequencies were not significantly different between distance and difficulty in leading teams remotely, $X^2(16, N = 243) = 20.260, p = .209$, and difficulty in leading teams remotely were found challenging.

Difficulty managing team members' productivity

Frequencies were not significantly different between distance and difficulty managing team members' productivity, $X^2(16, N = 243) = 7.523, p = .962$, and difficulty managing team members' productivity were found challenging.

H7= In virtual teams, time difference has a moderately negative impact on team effectiveness. The sample included 417 respondents. In H7, an association between time difference and team effectiveness was observed $X^2(5, N = 417) = 269.835, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. The variables are associated with each other and time difference has a moderately negative impact on team effectiveness.

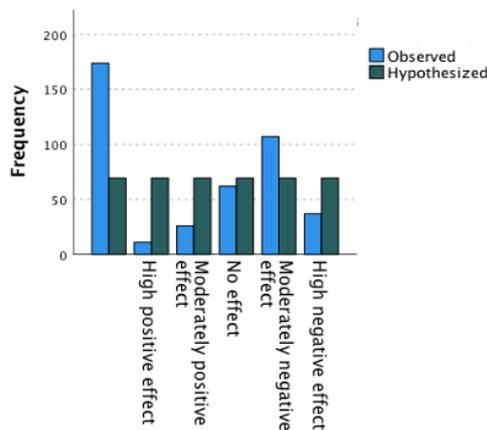


Figure 30. Time difference and team effectiveness relationship

❖ **Different cases for H7 and Challenges**

- **You are NOT in the same time zone:**

Graphs are shown in Appendix 30 with the explanations.

Virtual team members are speaking the same language and working at the same company

There was no significant difference between the same language, same company cases and time difference, $X^2(4, N = 106) = 6.939, p = .139$, virtual team members who are speaking the same language and working at the same company rated that time difference has a negative effect on team effectiveness.

Virtual team members are speaking the same language but NOT working at the same company

There was no significant difference between the same language, different company cases and time difference, $X^2(4, N = 106) = 7.008, p = .135$, virtual team members who are speaking the same language and working at different company rated that time difference has a negative effect on team effectiveness.

Virtual team members are NOT speaking the same language and working at the same company

There was no significant difference between the different language, same company cases and time difference, $X^2(4, N = 106) = 7.206, p = .125$, virtual team members who are speaking different language and working at the same company rated that time difference has a negative effect on team effectiveness.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was no significant difference between the different language, different company cases and time difference, $X^2(4, N = 106) = 2.157, p = .707$, virtual team members who are speaking different language and working at different company rated that time difference has a negative effect on team effectiveness.

Comparing the Challenges with Hypothesis 7:

Graphs are shown in Appendix 31 with the explanations. Challenges (e.g., having an effective communication, partners/members who do not participate meetings, misunderstandings due to differences in culture, language, meeting deadlines, difficulty in leading teams remotely, difficulty managing team members` productivity, managing conflict, establishing trust and relationship) are compared with hypothesis 7.

Having an effective communication

Frequencies were not significantly different between time difference and having an effective communication, $X^2(16, N = 243) = 21.392, p = .164$, and having an effective communication was found extremely challenging (58.0%).

Partners/members who do not participate meetings

Frequencies were not significantly different between time difference and partners/members who do not participate meetings, $X^2(16, N = 243) = 19.799, p = .229$, and partners/members who do not participate meetings was found very challenging (46.3%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between time difference and misunderstandings due to differences, $X^2(16, N = 243) = 23.173, p = .109$, and misunderstandings due to differences was found very challenging (44.9%).

Meeting deadlines

Frequencies were not significantly different between time difference and meeting deadlines, $X^2(16, N = 243) = 14.433, p = .567$, and meeting deadlines was found challenging (44.0%).

Difficulty in leading teams remotely

Frequencies were not significantly different between time difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 14.256, p = .580$, and difficulty in leading teams remotely was found very challenging (52.7%).

Difficulty managing team members' productivity

Frequencies were not significantly different between time difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 9.523, p = .890$, and difficulty managing team members' productivity was found challenging (41.3%).

Managing conflict

Frequencies were not significantly different between time difference and managing conflict, $X^2(16, N = 243) = 18.912, p = .273$, and managing conflict, and managing conflict was found very challenging (49.4%).

Establishing trust and relationship

There was no significant difference between time difference and establishing trust and relationship, $X^2(16, N = 243) = 17.183, p = .374$, suggesting that establishing trust and relationship can impact virtual team effectiveness since it was found challenging (46.4%).

7.4.1.1 The Summary of Hypotheses Results between H1-H7

According to the survey results, Table 15 shows the factors affecting virtual teams' efficiency according to their level of effect.

Table 15. Factors that affect virtual teams' efficiency (H1-H7)

	Frequency	Percentage	Effect
Trust	122	50.21%	High positive effect
Knowledge sharing	115	47.33%	High positive effect
Cultural difference	94	38.68%	Moderately positive effect
Language difference	122	50.21%	Moderately negative effect
Distance	95	39.09%	No effect
Time zone differences	107	44.03%	Moderately negative effect

Trust is the factor that is vital for virtual teams and has a high positive effect on virtual teams' efficiency. 50.21% of the participants agreed that trust is the foundation of a successful relationship and should exist in personal and team relationships.

It is very important to reach the right information and technology and share this knowledge with the virtual teams. According to the results, 47.33% of the participants agreed **knowledge sharing** has a high positive effect on virtual teams' efficiency.

It is expected that **cultural difference** has a negative effect on virtual teams. But Shachaf 2008, shared the interview results from 9 countries with 41 team members that cultural difference has a positive impact on decision making but a negative impact on communication. Also, from the survey results showed that 38.68% of the participants agreed cultural difference has a moderately positive effect on virtual teams' efficiency.

Team members from different countries have **different languages** which can bring some difficulties to communication. Language problem includes listening, reading, speaking problems and these problems can affect the virtual teams' efficiency. Results showed that 50.21% of the participants found language difference has a moderately negative effect on virtual teams' efficiency.

Distance can be a big problem if virtual teams cannot use the technology properly. Using wrong information and communication technologies lead to delays and affect the virtual teams' performance. But using the advantages of the technology will reduce the problems and risks. That's why in the survey, 39.09% of the participants said distance has no effect on virtual teams' efficiency.

Virtual teams use computer-supported communication tools, e.g., synchronous and asynchronous media for communication. The time difference can negatively affect the communication extensiveness between team members, and this can affect the virtual teams' efficiency. Results also showed that **time zone difference** has a moderately negative effect (44.03%) on virtual teams' efficiency.

7.4.2 Hypothesis Analysis between H8-H24

The research model proposes that communication/coordination mechanisms are impacted by virtual team influencing factors which are distance, language difference, time difference, cultural difference, and trust. The findings indicate that some virtual team influencing factors have a greater impact than others on communication/collaboration mechanisms. In this section, the relation between virtual team influencing factors and communication/collaboration mechanisms are analyzed in detail.

7.4.2.1 The Impact of Virtual Team Influencing Factors on the Effectiveness of Standards

H8= Distance has a moderately negative effect on the effectiveness of standards.

The sample included 417 respondents. In H8, an association between distance and effectiveness of standards was observed $X^2(5, N = 417) = 262.698, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. It is expected that distance has a moderately negative effect on the effectiveness of standards. According to the responses the variables are associated with each other and distance has no effect on the effectiveness of standards. Thus, H8 is not supported.

Answer	Count	Percentage
Highly positive (A1)	17	6.88%
Moderately positive (A2)	45	18.22%
No effect (A3)	90	36.44%
Moderately negative (A4)	83	33.60%
Highly negative (A5)	11	4.45%
No answer	1	0.40%

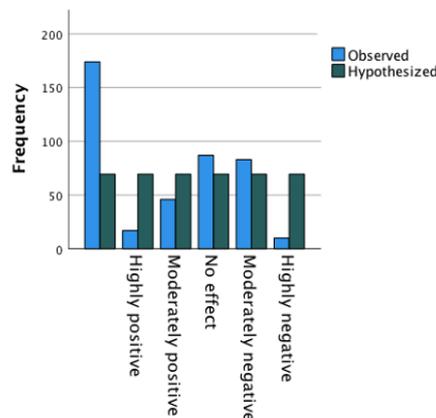


Figure 31. Relationship between distance and effectiveness of standards

❖ **Different cases for H8 and Challenges**

➤ **You are in the same time zone but NOT in the same country:**

Distance is compared between the same time zone different country cases. Graphs are shown in Appendix 32 with the explanations

Virtual team members are speaking the same language and working at the same company

There was no significant difference between the same language, same company cases, and distance, $X^2(3, N = 14) = 3.547, p = .315$, virtual team members who are speaking the same language and working at the same company rated that distance has no effect on the effectiveness of standards.

Virtual team members are speaking the same language but NOT working at the same company

There was no significant difference between the same language, different company cases, and distance, $X^2(3, N = 14) = 1.329, p = .722$, virtual team members who are speaking the same language and working at different company rated that distance has no effect on the effectiveness of standards.

Virtual team members are NOT speaking the same language and working at the same company

There was no significant difference between the different language, same company cases, and distance, $X^2(3, N = 14) = 1.923, p = .588$, virtual team members who are speaking the different language and working at the same company rated that distance has no effect on the effectiveness of standards.

Virtual team members are NOT speaking the same language and NOT working at the same company.

There was no significant difference between the different language, different company cases, and distance, $X^2(3, N = 14) = 2.730, p = .435$, virtual team members who are speaking the different language and working at different company rated that distance has a moderately negative effect on the effectiveness of standards.

➤ **You are NOT in the same time zone:**

Distance is compared with the different time zone case. Graphs are shown in Appendix 33 with the explanations.

Virtual team members are speaking the same language and working at the same company

There was no significant difference between the same language, same company cases, and distance, $X^2(4, N = 106) = 6.833, p = .145$, virtual team members who are speaking the same

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language and working at the same company rated that distance has no effect on the effectiveness of standards.

Virtual team members are speaking the same language but NOT working at the same company

There was no significant difference between the same language, different company cases, and distance, $X^2(4, N = 106) = 8.166, p = .086$, virtual team members who are speaking the same language and working at different company rated that distance has a moderately negative effect on the effectiveness of standards.

Virtual team members are NOT speaking the same language and working at the same company

There was no significant difference between different language, same company cases, and distance, $X^2(4, N = 106) = 4.495, p = .343$, virtual team members who are speaking different language and working at the same company rated that distance has no effect on the effectiveness of standards.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was no significant difference between different language, different company cases, and distance, $X^2(4, N = 106) = 7.522, p = .111$, virtual team members who are speaking a different language and working at different company rated that distance has a moderately negative effect on the effectiveness of standards.

Comparing the Challenges with Hypothesis 8:

Graphs are shown in Appendix 34 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having effective communication, time zones, partners/members who do not participate meetings, misunderstandings due to differences in culture, language, meeting deadlines, difficulty in leading teams remotely, difficulty managing team members' productivity) are compared with hypothesis 8.

Managing conflict

Frequencies were significantly different between distance and managing conflict, $X^2(16, N = 243) = 46.266, p = .000$, and managing conflict was found challenging (38.8%).

Establishing trust and relationship

Frequencies were significantly different between establishing trust and relationship and distance, $X^2(16, N = 243) = 26.770, p = .044$, and establishing trust and relationship was found challenging (42.0%).

Having an effective communication

Frequencies were significantly different between distance and effective communication, $X^2(16, N = 243) = 34.457, p = .005$, and having an effective communication was found challenging (49.3%).

Time zones

Frequencies were significantly different between distance and time zones, $X^2(16, N = 243) = 34.051, p = .044$, and time zones were found challenging (49.2%).

Partners/members who do not participate meetings

Frequencies were significantly different between distance and partners/members who do not participate meetings, $X^2(16, N = 243) = 29.528, p = .021$, and partners/members who do not participate meetings was found very challenging (43.8%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between distance and misunderstandings due to differences, $X^2(16, N = 243) = 20.579, p = .195$, and misunderstandings due to differences were found very challenging (35.9%).

Meeting deadlines

Frequencies were not significantly different between distance and meeting deadlines, $X^2(16, N = 243) = 13.110, p = .665$, and meeting deadlines was found challenging (41.3%).

Difficulty in leading teams remotely

Frequencies were significantly different between distance and difficulty in leading teams remotely, $X^2(16, N = 243) = 30.682, p = .015$, and difficulty in leading teams remotely was found challenging (36.8%).

Difficulty managing team members' productivity

Frequencies were not significantly different between distance and difficulty managing team members' productivity, $X^2(16, N = 243) = 24.128, p = .087$, and difficulty managing team members' productivity was found challenging (40.0%).

Hypothesis 9: Language difference has a moderately negative effect on the effectiveness of standards.

The sample included 417 respondents. In H9, an association between language difference and effectiveness of standards was observed $X^2(5, N = 417) = 293.662, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. The variables are associated

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with each other and language difference has a moderately negative effect on the effectiveness of standards.

Answer	Count	Percentage
Highly positive (A1)	13	5.26%
Moderately positive (A2)	35	14.17%
No effect (A3)	65	26.32%
Moderately negative (A4)	117	47.37%
Highly negative (A5)	15	6.07%
No answer	2	0.81%

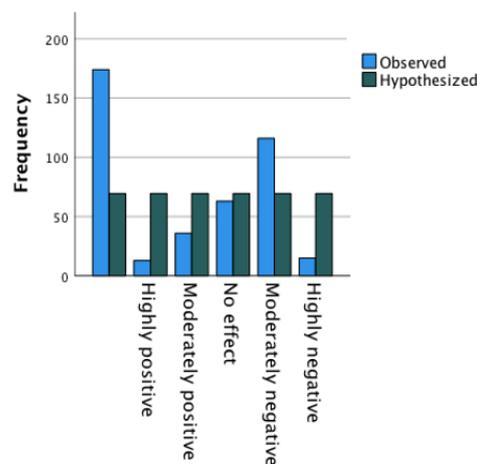


Figure 32. Relationship between language difference and effectiveness of standards

❖ Different cases for H9 and Challenges

➤ You are in the same time zone and working at the same country:

Language differences are compared with the same time zone same country case. Graphs are shown in Appendix 35 with the explanations.

Virtual team members are NOT speaking the same language and working at the same company

There was no significant difference between the different language, same company cases, and language difference, $X^2(4, N = 123) = 2.243, p = .691$, virtual team members who are speaking the different language and working at the same company rated that language difference has a moderately negative effect on the effectiveness of standards.

➤ **You are in the same time zone but NOT in the same country:**

Language differences are compared with the same time zone in different country cases. Graphs are shown in Appendix 36 with the explanations.

Virtual team members are NOT speaking the same language and working at the same company

There was a significant difference between the different language, same company cases, and language difference, $X^2(3, N = 14) = 8.061, p = .045$, virtual team members who are speaking the different language and working at the same company rated that language difference has a moderately negative effect on the effectiveness of standards.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was not a significant difference between the different language, different company cases, and language difference, $X^2(3, N = 14) = 1.138, p = .768$, virtual team members who are speaking the different language and working at different company rated that language difference has no effect on the effectiveness of standards.

➤ **You are NOT in the same time zone:**

Language differences are compared with the different time zone cases. Graphs are shown in Appendix 37 with the explanations.

Virtual team members are NOT speaking the same language and working at the same company

There was not a significant difference between the different language, same company cases, and language difference, $X^2(4, N = 106) = 7.465, p = .113$, virtual team members who are speaking a different language and working at the same company rated that language difference has no effect on the effectiveness of standards.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was a significant difference between the different language, different company cases, and language difference, $X^2(4, N = 106) = 10.935, p = .027$, virtual team members who are speaking a different language and working at different company rated that language difference has a moderately negative effect on the effectiveness of standards.

Comparing the Challenges with Hypothesis 9:

Graphs are shown in Appendix 38 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having effective communication, partners/members who do

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not participate meetings, misunderstandings due to differences in culture, language, meeting deadlines, difficulty in leading teams remotely, difficulty managing team members' productivity, presenting ideas during meetings) are compared with hypothesis 9.

Managing conflict

Frequencies were not significantly different between language difference and managing conflict, $X^2(16, N = 243) = 13.920$, $p = .605$, and managing conflict was found challenging (50.0%).

Establishing trust and relationship

Frequencies were not significantly different between language difference and establishing trust and relationship, $X^2(16, N = 243) = 12.502$, $p = .709$, and establishing trust and relationship was found challenging (46.4%).

Having an effective communication

Frequencies were not significantly different between language difference and having an effective communication, $X^2(16, N = 243) = 14.218$, $p = .582$, and having an effective communication was found challenging (50.7%).

Partners/members who do not participate meetings

Frequencies were not significantly different between language difference and partners/members who do not participate meetings, $X^2(16, N = 243) = 13.024$, $p = .671$, and partners/members who do not participate meetings was very found challenging (47.5%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between language difference and misunderstandings due to differences, $X^2(16, N = 243) = 16.735$, $p = .403$, and misunderstandings due to differences was found very challenging (52.6%).

Meeting deadlines

Frequencies were not significantly different between language difference and meeting deadlines, $X^2(16, N = 243) = 10.292$, $p = .851$, and meeting deadlines was found challenging (46.7%).

Difficulty in leading teams remotely

Frequencies were not significantly different between language difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 12.824$, $p = .686$, and difficulty in leading teams remotely was found challenging (40.8%).

Difficulty managing team members’ productivity

Frequencies were not significantly different between language difference and difficulty managing team members’ productivity, $X^2(16, N = 243) = 11.506, p = .777$, and difficulty managing team members’ productivity was found challenging (47.5%).

Presenting ideas during meetings

Frequencies were not significantly different between language difference and presenting ideas during meetings, $X^2(16, N = 243) = 20.191, p = .212$, and presenting ideas during meetings was found challenging (45.8%).

H10: Trust has a moderately positive effect on the effectiveness of standards.

The sample included 417 respondents. In H10, an association between trust and effectiveness of standards was observed $X^2(5, N = 417) = 279.216, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. The variables are associated with each other and trust has a moderately positive effect on the effectiveness of standards.

Answer	Count	Percentage
Highly positive (A1)	75	30.36%
Moderately positive (A2)	102	41.30%
No effect (A3)	46	18.62%
Moderately negative (A4)	19	7.69%
Highly negative (A5)	3	1.21%
No answer	2	0.81%

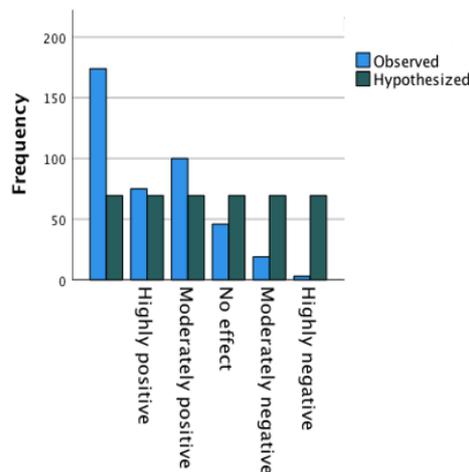


Figure 33. Relationship between trust and effectiveness of standards

❖ **Different cases for H10 and Challenges**

➤ **Roles:**

Trust is compared with the roles of the participants and the frequencies of participants did not differ by their role except team member; H10- Project Leader/Coordinator: $X^2(4, N = 243) = 5.807, p = .214$, H10 – Project Manager: $X^2(4, N = 243) = 4.713, p = .318$, H10 – Team Member: $X^2(4, N = 243) = 15.028, p = .005$, H10 – Researcher: $X^2(4, N = 243) = 4.535, p = .338$. Graphs are shown in Appendix 39.

Comparing the Challenges with Hypothesis 10:

Graphs are shown in Appendix 40 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having effective communication, misunderstandings due to differences in culture, language, meeting deadlines, difficulty in leading teams remotely, difficulty managing team members' productivity) are compared with hypothesis 10.

Managing conflict

Frequencies were not significantly different between trust and managing conflict, $X^2(16, N = 243) = 17.604, p = .348$, and managing conflict was found challenging (42.5%).

Establishing trust and relationship

Frequencies were significantly different between trust and establishing trust and relationship, $X^2(16, N = 243) = 28.312, p = .029$, and establishing trust and relationship was found challenging (49.3%).

Having an effective communication

Frequencies were significantly different between trust and having an effective communication, $X^2(16, N = 243) = 41.511, p = .000$, and having an effective communication was found challenging (50.7%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between trust and misunderstandings due to differences, $X^2(16, N = 243) = 15.334, p = .500$, and misunderstandings due to differences was found challenging (47.0%).

Meeting deadlines

Frequencies were significantly different between trust and meeting deadlines, $X^2(16, N = 243) = 28.981, p = .024$, and meeting deadlines was found challenging (48.0%).

Difficulty in leading teams remotely

Frequencies were not significantly different between trust and difficulty in leading teams remotely, $X^2(16, N = 243) = 24.014, p = .089$, and difficulty in leading teams remotely was found challenging (44.7%).

Difficulty managing team members' productivity

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Frequencies were significantly different between trust and difficulty managing team members' productivity, $X^2(16, N = 243) = 42.401, p = .000$, and difficulty managing team members' productivity was found challenging (43.8%).

7.4.2.2 The Impact of Virtual Team Influencing Factors on the Effectiveness of Plans

According to the responses, plans are impacted by distance, time difference, cultural difference, and trust.

H11: Distance has a moderately negative effect on the effectiveness of plans.

The sample included 417 respondents. In H11, an association between distance and effectiveness of plans was observed $X^2(5, N = 417) = 292.683, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. It is expected that distance has a moderately negative effect on the effectiveness of plans. According to the responses the variables are associated with each other and distance has no effect on the effectiveness of plans. Thus, H11 is not supported.

Answer	Count	Percentage
Highly positive (A1)	15	6.07%
Moderately positive (A2)	35	14.17%
No effect (A3)	106	42.91%
Moderately negative (A4)	82	33.20%
Highly negative (A5)	7	2.83%
No answer	2	0.81%

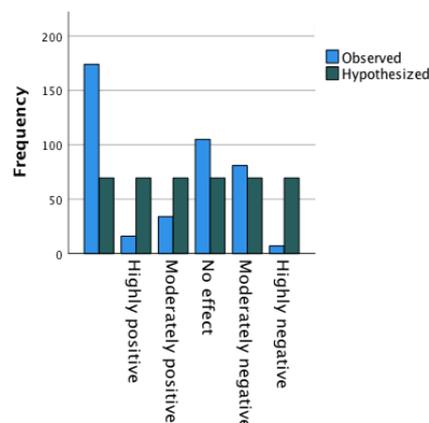


Figure 34. Relationship between distance and effectiveness of plans

❖ Different cases for H11 and Challenges

- You are in the same time zone but NOT in the same country:

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Distance is compared between the same time zone different country cases. Graphs are shown in Appendix 41 with the explanations.

Virtual team members are speaking the same language and working at the same company

There was no significant difference between the same language, same company cases and distance, $X^2(3, N = 14) = 2.975, p = .395$, virtual team members who are speaking the same language and working at the same company rated that distance has no effect on the effectiveness of plans.

Virtual team members are speaking the same language but NOT working at the same company

There was no significant difference between the same language, different company cases, and distance, $X^2(3, N = 14) = 0.636, p = .888$, virtual team members who are speaking the same language and working at different company rated that distance has no effect on the effectiveness of plans.

Virtual team members are NOT speaking the same language and working at the same company

There was no significant difference between the different language, same company cases, and distance, $X^2(3, N = 14) = 0.636, p = .888$, virtual team members who are speaking the different language and working at the same company rated that distance has no effect on the effectiveness of plans.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was no significant difference between the different language, different company cases, and distance, $X^2(3, N = 14) = 2.975, p = .395$, virtual team members who are speaking the different language and working at different company rated that distance has no effect on the effectiveness of plans.

➤ **You are NOT in the same time zone:**

Distance is compared with the different time zone case. Graphs are shown in Appendix 42 with the explanations.

Virtual team members are speaking the same language and working at the same company

There was a significant difference between the same language, same company cases, and distance, $X^2(4, N = 106) = 15.725, p = .003$, virtual team members who are speaking the same language and working at the same company rated that distance has no effect on the effectiveness of plans.

Virtual team members are speaking the same language but NOT working at the same company

There was no significant difference between the same language, different company cases, and distance, $X^2(4, N = 106) = 2.320, p = .677$, virtual team members who are speaking the same language and working at different company rated that distance has no effect on the effectiveness of plans.

Virtual team members are NOT speaking the same language and working at the same company

There was no significant difference between the different language, same company cases, and distance, $X^2(4, N = 106) = 4.213, p = .378$, virtual team members who are speaking the different language and working at the same company rated that distance has a moderately negative effect on the effectiveness of plans.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was no significant difference between the different language, different company cases, and distance, $X^2(4, N = 106) = 4.460, p = .347$, virtual team members who are speaking the different language and working at different company rated that distance has a moderately negative effect on the effectiveness of plans.

Comparing the Challenges with Hypothesis 11:

Graphs are shown in Appendix 43 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having an effective communication, misunderstandings due to differences in culture, language, meeting deadlines, difficulty in leading teams remotely, difficulty managing team members' productivity, loss of productivity due to the IT problems, time zones, Partners/members who do not participate meetings) are compared with hypothesis 11.

Managing conflict

Frequencies were significantly different between distance and managing conflict, $X^2(16, N = 243) = 34.045, p = .005$, and managing conflict was found very challenging.

Establishing trust and relationship

Frequencies were significantly different between distance and establishing trust and relationship, $X^2(16, N = 243) = 32.053, p = .010$, and establishing trust and relationship was found challenging.

Having an effective communication

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Frequencies were significantly different between distance and having an effective communication, $X^2(16, N = 243) = 30.359, p = .016$, and having an effective communication was found challenging.

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between distance and misunderstandings due to differences, $X^2(16, N = 243) = 20.251, p = .209$, and misunderstandings due to differences were found challenging.

Meeting deadlines

Frequencies were significantly different between distance and meeting deadlines, $X^2(16, N = 243) = 34.406, p = .005$, and meeting deadlines was found challenging.

Difficulty in leading teams remotely

Frequencies were not significantly different between distance and difficulty in leading teams remotely, $X^2(16, N = 243) = 21.870, p = .147$, and difficulty in leading teams remotely was found challenging.

Difficulty managing team members' productivity

Frequencies were not significantly different between distance and difficulty managing team members' productivity, $X^2(16, N = 243) = 20.835, p = .185$, and difficulty managing team members' productivity was found challenging.

Loss of productivity due to the IT problems

Frequencies were significantly different between distance and loss of productivity due to the IT problems, $X^2(16, N = 243) = 29.735, p = .019$, and loss of productivity due to the IT problems were found challenging.

Time zones

Frequencies were significantly different between distance and time zones, $X^2(16, N = 243) = 27.611, p = .035$, and time zones were found challenging.

Partners/members who do not participate meetings

Frequencies were not significantly different between distance and partners/members who do not participate meetings, $X^2(16, N = 243) = 18.213, p = .312$, and partners/members who do not participate meetings were found very challenging.

H12: Cultural difference has a moderately negative effect on the effectiveness of plans.

The sample included 417 respondents. In H12, an association between cultural difference and effectiveness of plans was observed $X^2(5, N = 417) = 254.353, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent

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in the entire population and the result is significant. It is expected that cultural difference has a moderately negative effect on the effectiveness of plans. According to the responses the variables are associated with each other and cultural difference has no effect on the effectiveness of plans. Thus, H12 is not supported.

Answer	Count	Percentage
Highly positive (A1)	21	8.50%
Moderately positive (A2)	70	28.34%
No effect (A3)	90	36.44%
Moderately negative (A4)	57	23.08%
Highly negative (A5)	7	2.83%
No answer	2	0.81%

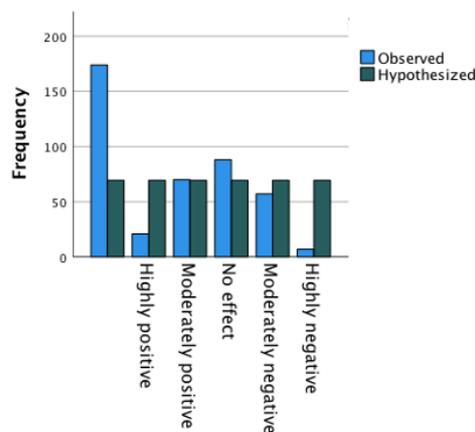


Figure 35. Relationship between cultural difference and effectiveness of plans

❖ Different cases for H12 and Challenges

➤ Cultural Difference:

Graphs are shown in Appendix 44 with the explanations.

There is no cultural diversity within the team

Frequencies were not significantly different, $X^2(4, N = 243) = .414, p = .981$, and if there is no cultural diversity within the team it has no effect on the effectiveness of plans.

There is a small mix of cultural diversity within the team

Frequencies were significantly different, $X^2(4, N = 243) = 14.929, p = .005$, and if there is a small mix of cultural diversity within the team it has no effect on the effectiveness of plans.

There is a remarkable degree of cultural diversity within the team

Frequencies were not significantly different, $X^2(4, N = 243) = 7.726, p = .102$, and if there is a remarkable degree of cultural diversity within the team it has a moderately negative effect on the effectiveness of plans.

The team is 100 % culturally diverse

Frequencies were not significantly different, $X^2(4, N = 243) = 4.277, p = .370$, and if the team is 100 % culturally diverse has a moderately negative effect on the effectiveness of plans.

➤ **Role:**

Cultural difference is compared with the roles of the participants and the frequencies of participants differ by their role except Researcher. H12 - Project Leader/Coordinator: $X^2(4, N = 243) = 21.831, p = .000$, H12 - Project Manager: $X^2(4, N = 243) = 17.173, p = .002$, H12 - Team Member: $X^2(4, N = 243) = 10.327, p = .035$, H12 - Researcher: $X^2(4, N = 243) = .466, p = .977$. Thus, these frequencies were significantly different. Graphs are shown in Appendix 45.

Comparing the Challenges with Hypothesis 12:

Graphs are shown in Appendix 46 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having effective communication, misunderstandings due to differences in culture, language, meeting deadlines, difficulty in leading teams remotely, difficulty managing team members` productivity) are compared with hypothesis 12.

Managing conflict

Frequencies were not significantly different between cultural difference and managing conflict, $X^2(16, N = 243) = 19.415, p = .248$, and managing conflict was found challenging (41.3%).

Establishing trust and relationship

Frequencies were not significantly different between cultural difference and establishing trust and relationship, $X^2(16, N = 243) = 19.950, p = .222$, and establishing trust and relationship was found challenging (37.7%).

Having an effective communication

Frequencies were not significantly different between cultural difference and having an effective communication, $X^2(16, N = 243) = 24.091, p = .088$, and having an effective communication was found challenging (38.8%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between cultural difference and misunderstandings due to differences, $X^2(16, N = 243) = 22.584, p = .125$, and misunderstandings due to differences was found challenging (40.9%).

Meeting deadlines

Frequencies were significantly different between cultural difference and meeting deadlines, $X^2(16, N = 243) = 18.814, p = .278$, and meeting deadlines was found challenging (32.0%).

Difficulty in leading teams remotely

Frequencies were not significantly different between cultural difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 25.637, p = .059$, and difficulty in leading teams remotely was found challenging (42.1%).

Difficulty managing team members' productivity

Frequencies were not significantly different between cultural difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 18.185, p = .313$, and difficulty managing team members' productivity was found challenging (43.8%).

H13: Trust has a moderately positive effect on the effectiveness of plans.

The sample included 417 respondents. In H13, an association between trust and effectiveness of plans was observed $X^2(5, N = 417) = 287.906, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. The variables are associated with each other and trust has a moderately positive effect on the effectiveness of plans.

Answer	Count	Percentage
Highly positive (A1)	66	26.72%
Moderately positive (A2)	111	44.94%
No effect (A3)	45	18.22%
Moderately negative (A4)	20	8.10%
Highly negative (A5)	3	1.21%
No answer	2	0.81%

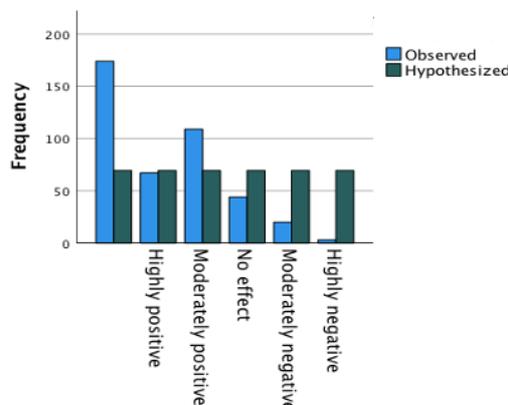


Figure 36. Relationship between trust and effectiveness of plans

❖ **Different cases for H13 and Challenges**

➤ **Roles:**

Trust is compared with the roles of the participants and the frequencies of participants did not differ by their role. H13 - Project Leader/Coordinator: $X^2(4, N = 243) = 3.618, p = .460$, H13 - Project Manager: $X^2(4, N = 243) = .813, p = .937$, H13 - Team Member: $X^2(4, N = 243) = 1.322, p = .858$, H13 - Researcher: $X^2(4, N = 243) = 2.773, p = .597$. Thus, these frequencies were not significantly different. Graphs are shown in Appendix 47.

Comparing the Challenges with Hypothesis 13:

Graphs are shown in Appendix 48 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having effective communication, misunderstandings due to differences in culture, language, meeting deadlines, difficulty in leading teams remotely, difficulty managing team members' productivity) are compared with hypothesis 13.

Managing conflict

Frequencies were not significantly different between trust and managing conflict, $X^2(16, N = 243) = 11.933, p = .749$, and managing conflict was found challenging (46.3%).

Establishing trust and relationship

Frequencies were not significantly different between trust and establishing trust and relationship, $X^2(16, N = 243) = 10.916, p = .815$, and establishing trust and relationship was found challenging (47.8%).

Having an effective communication

Frequencies were not significantly different between trust and having an effective communication, $X^2(16, N = 243) = 18.203, p = .312$, and having an effective communication was found challenging (47.8%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between trust and misunderstandings due to differences, $X^2(16, N = 243) = 9.970, p = .868$, and misunderstandings due to differences was found very challenging (43.6%).

Meeting deadlines

Frequencies were significantly different between trust and meeting deadlines, $X^2(16, N = 243) = 27.367, p = .038$, and meeting deadlines was found somewhat challenging (54.5%).

Difficulty in leading teams remotely

Frequencies were not significantly different between trust and difficulty in leading teams remotely, $X^2(16, N = 243) = 17.757, p = .338$, and difficulty in leading teams remotely was found challenging (47.4%).

Difficulty managing team members’ productivity

Frequencies were not significantly different between trust and difficulty managing team members’ productivity, $X^2(16, N = 243) = 23.543, p = .100$, and difficulty managing team members’ productivity was found challenging (50.0%).

H14: Time difference has a moderately negative effect on effectiveness of plans.

The sample included 417 respondents. In H14, an association between time difference and effectiveness of plans was observed $X^2(5, N = 417) = 269.432, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. The variables are associated with each other and time difference has a moderately negative effect on the effectiveness of plans.

Answer	Count	Percentage
Highly positive (A1)	11	4.45%
Moderately positive (A2)	35	14.17%
No effect (A3)	75	30.36%
Moderately negative (A4)	102	41.30%
Highly negative (A5)	22	8.91%
No answer	2	0.81%

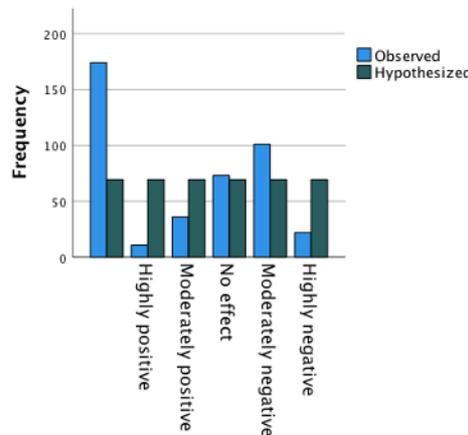


Figure 37. Relationship between time difference and effectiveness of plans

❖ **Different cases for H14 and Challenges**

- **You are NOT in the same time zone.**

Time difference is compared with the different time zone case. Graphs are shown in Appendix 49 with the explanations.

Virtual team members are speaking the same language and working at the same company

There was not a significant difference between the same language, same company cases, and time difference, $X^2(4, N = 106) = 7.345, p = .119$, virtual team members who are speaking the

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same language and working at the same company rated that time difference has a moderately negative effect on the effectiveness of plans.

Virtual team members are speaking the same language but not working at the same company

There was not a significant difference between the same language, different company cases, and time difference, $X^2(4, N = 106) = 4.685, p = .321$, virtual team members who are speaking the same language and working at different company rated that time difference has a moderately negative effect on the effectiveness of plans.

Virtual team members are NOT speaking the same language and working at the same company

There was not a significant difference between the different language, same company cases, and time difference, $X^2(4, N = 106) = 3.376, p = .497$, virtual team members who are speaking a different language and working at the same company rated that time difference has a moderately negative effect on the effectiveness of plans.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was not a significant difference between the different language, different company cases, and time difference, $X^2(4, N = 106) = 6.241, p = .182$, virtual team members who are speaking a different language and working at different company rated that time difference has a moderately negative effect on the effectiveness of plans.

Comparing the Challenges with Hypothesis 14:

Graphs are shown in Appendix 50 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having an effective communication, misunderstandings due to differences in culture, language, meeting deadlines, difficulty in leading teams remotely, difficulty managing team members' productivity, partners/members who do not participate meetings) are compared with hypothesis 14.

Managing conflict.

Frequencies were not significantly different between time difference and managing conflict, $X^2(16, N = 243) = 23.147, p = .110$, and managing conflict was found very challenging (51.9%).

Establishing trust and relationship

Frequencies were not significantly different between time difference and establishing trust and relationship, $X^2(16, N = 243) = 17.636, p = .346$, and establishing trust and relationship was found challenging (44.9%).

Having an effective communication

Frequencies were significantly different between time difference and having an effective communication, $X^2(16, N = 243) = 27.276, p = .039$, and having an effective communication was found challenging (44.8%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between time difference and misunderstandings due to differences, $X^2(16, N = 243) = 11.409, p = .784$, and misunderstandings due to differences were found very challenging (38.5%).

Meeting deadlines

Frequencies were not significantly different between time difference and meeting deadlines, $X^2(16, N = 243) = 9.867, p = .873$, and meeting deadlines was found challenging (42.7%).

Difficulty in leading teams remotely

Frequencies were not significantly different between time difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 14.925, p = .530$, and difficulty in leading teams remotely was found challenging (39.5%).

Difficulty managing team members' productivity

Frequencies were not significantly different between time difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 11.872, p = .753$, and difficulty managing team members' productivity was found challenging (37.5%).

Partners/members who do not participate meetings

Frequencies were significantly different between time difference and partners/members who do not participate meetings, $X^2(16, N = 243) = 35.776, p = .003$, and partners/members who do not participate meetings was found very challenging (42.5%).

7.4.2.3 The Impact of Virtual Team Influencing Factors on the Formal Mutual Coherence

H15: Distance has a moderately negative effect on the formal mutual coherence.

The sample included 417 respondents. In H15, an association between distance and effect on the formal mutual coherence was observed $X^2(5, N = 417) = 273.892, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. It is expected that distance has a moderately negative effect on the formal mutual coherence. According to the responses, the variables are associated with each other and distance has no effect on the formal mutual coherence. Thus, H15 is not supported.

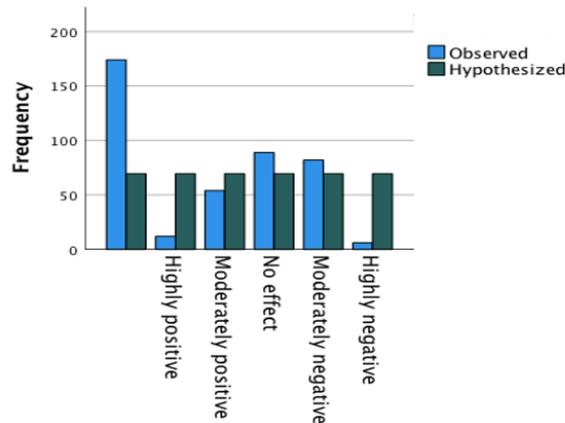


Figure 38. Relationship between distance and formal mutual coherence

❖ Different cases for H15 and Challenges

➤ Role:

Distance is compared with the roles of the participants and the frequencies of participants did not differ by their role; H15- Project Leader/Coordinator: $X^2(4, N = 243) = 2.900, p = .575$, H15 – Project Manager: $X^2(4, N = 243) = 6.044, p = .196$, H15 – Team Member: $X^2(4, N = 243) = 6.231, p = .183$, H15 – Researcher: $X^2(4, N = 243) = 2.487, p = .647$. Thus, these frequencies were not significantly different. Distance has a moderately negative effect on the formal mutual coherence according to researcher and project manager, and no effect on the formal mutual coherence according to project leader/coordinator and team member. Graphs are shown in Appendix 51.

➤ You are in the same time zone but NOT in the same country:

Distance is compared between the same time zone different country case. Graphs are shown in Appendix 52 with the explanations

Virtual team members are speaking the same language and working at the same company

There was no significant difference between the same language, same company cases, and distance, $X^2(2, N = 14) = .525, p = .769$, virtual team members who are speaking the same language and working at the same company rated that distance has no effect on the formal mutual coherence.

Virtual team members are speaking the same language but NOT working at the same company

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There was no significant difference between the same language, different company cases, and distance, $X^2(2, N = 14) = .636, p = .727$, virtual team members who are speaking the same language and working at different company rated that distance has no effect on the formal mutual coherence.

Virtual team members are NOT speaking the same language and working at the same company

There was no significant difference between the different language, same company cases, and distance, $X^2(2, N = 14) = .636, p = .727$, virtual team members who are speaking the different language and working at the same company rated that distance has no effect on the formal mutual coherence.

Virtual team members are NOT speaking the same language and NOT working at the same company.

There was no significant difference between the different language, different company cases, and distance, $X^2(2, N = 14) = .525, p = .769$, virtual team members who are speaking the different language and working at different company rated that distance has no effect on the formal mutual coherence.

➤ You are NOT in the same time zone:

Distance is compared with different time zone case. Graphs are shown in Appendix 53 with the explanations.

Virtual team members are speaking the same language and working at the same company

There was no significant difference between the same language, same company cases, and distance, $X^2(4, N = 106) = 1.407, p = .843$, virtual team members who are speaking the same language and working at the same company rated that distance has a moderately negative effect on the formal mutual coherence.

Virtual team members are speaking the same language but NOT working at the same company

There was no significant difference between the same language, different company cases, and distance, $X^2(4, N = 106) = 5.886, p = .208$, virtual team members who are speaking the same language and working at different company rated that distance has no effect on the formal mutual coherence.

Virtual team members are NOT speaking the same language and working at the same company

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There was no significant difference between different language, same company cases, and distance, $X^2(4, N = 106) = 3.537, p = .472$, virtual team members who are speaking different language and working at the same company rated that distance has a moderately negative effect on the formal mutual coherence.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was no significant difference between different language, different company cases, and distance, $X^2(4, N = 106) = 7.043, p = .134$, virtual team members who are speaking different language and working at different company rated that distance has a moderately negative effect on the formal mutual coherence.

Comparing the Challenges with Hypothesis 15:

Graphs are shown in Appendix 54 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having an effective communication, misunderstandings due to differences in culture, language, meeting deadlines, difficulty in leading teams remotely, difficulty managing team members' productivity, partners/members who do not participate meetings, time zones, loss of productivity due to the IT problems) are compared with hypothesis 15.

Managing conflict

Frequencies were significantly different between distance and managing conflict, $X^2(16, N = 243) = 26.323, p = .050$, and managing conflict was found challenging (42.5%).

Establishing trust and relationship

Frequencies were significantly different between establishing trust and relationship and distance, $X^2(16, N = 243) = 34.816, p = .004$, and establishing trust and relationship was found challenging (39.1%).

Having an effective communication

Frequencies were significantly different between distance and effective communication, $X^2(16, N = 243) = 24.851, p = .072$, and having an effective communication was found challenging (41.8%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between distance and misunderstandings due to differences, $X^2(16, N = 243) = 17.130, p = .377$, and misunderstandings due to differences were found very challenging (33.3%).

Meeting deadlines

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Frequencies were not significantly different between distance and meeting deadlines, $X^2(16, N = 243) = 24.631, p = .077$, and meeting deadlines was found challenging (36.0%).

Difficulty in leading teams remotely

Frequencies were significantly different between distance and difficulty in leading teams remotely, $X^2(16, N = 243) = 35.515, p = .003$, and difficulty in leading teams remotely was found somewhat challenging (53.6%).

Difficulty managing team members' productivity

Frequencies were significantly different between distance and difficulty managing team members' productivity, $X^2(16, N = 243) = 30.598, p = .015$, and difficulty managing team members' productivity was found challenging (37.5%).

8. Partners/members who do not participate meetings.

Frequencies were not significantly different between distance and partners/members who do not participate meetings, $X^2(16, N = 243) = 23.301, p = .106$, and partners/members who do not participate meetings was found very challenging (37.5%).

9. Time zones.

Frequencies were not significantly different between distance and time zones, $X^2(16, N = 243) = 24.459, p = .080$, and time zones were found challenging (44.6%).

10. Loss of productivity due to the IT problems.

Frequencies were significantly different between distance and loss of productivity due to the IT problems, $X^2(16, N = 243) = 28.730, p = .026$, and loss of productivity due to the IT problems were found challenging (40.8%).

H16: Language difference has a moderately negative effect on the formal mutual coherence.

The sample included 417 respondents. In H16, an association between language difference and effect on the formal mutual coherence was observed $X^2(5, N = 417) = 294.353, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. The variables are associated with each other and language difference has a moderately negative effect on the formal mutual coherence.

Answer	Count	Percentage
Highly positive (A1)	13	5.26%
Moderately positive (A2)	32	12.96%
No effect (A3)	71	28.74%
Moderately negative (A4)	115	46.56%
Highly negative (A5)	14	5.67%
No answer	2	0.81%

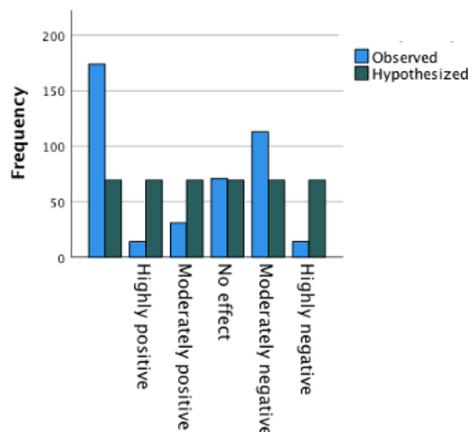


Figure 39. Relationship between language difference and formal mutual coherence

❖ Different cases for H16 and Challenges

➤ You are in the same time zone and working at the same country:

Language differences are compared between the same time zone and same country case.

Graphs are shown in Appendix 55 with the explanations.

Virtual team members are NOT speaking the same language and working at the same company

There was not a significant difference between the different language and same company cases, $X^2(4, N = 123) = 4.867, p = .301$, virtual team members who are speaking different languages and working at the same company rated that language difference has a moderately negative effect on the formal mutual coherence.

➤ You are in the same time zone but NOT in the same country:

Language differences are compared between the same time zone and different country cases.

Graphs are shown in Appendix 56 with the explanations.

Virtual team members are NOT speaking the same language and working at the same company

There was not a significant difference between the different language and same company cases, $X^2(3, N = 14) = 1.131, p = .770$, virtual team members who are speaking different languages and working at the same company rated that language difference has no effect on the formal mutual coherence.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was not a significant difference between the different language and different company cases, $X^2(3, N = 14) = 1.546, p = .672$, virtual team members who are speaking different

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languages and working at different company rated that language difference has no effect on the formal mutual coherence.

➤ **You are NOT in the same time zone:**

Language difference is compared with different time zone case. Graphs are shown in Appendix 57 with the explanations.

Virtual team members are NOT speaking the same language and working at the same company

There was not a significant difference between the different language and same company cases, $X^2(4, N = 106) = 3.549, p = .470$, virtual team members who are speaking different languages and working at the same company rated that language difference has a moderately negative effect on the formal mutual coherence.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was not a significant difference between the different language and different company cases, $X^2(4, N = 106) = 3.148, p = .533$, virtual team members who are speaking different languages and working at different company rated that language difference has a moderately negative effect on the formal mutual coherence.

Comparing the Challenges with Hypothesis 16:

Graphs are shown in Appendix 58 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having an effective communication, misunderstandings due to differences in culture, language, meeting deadlines, difficulty in leading teams remotely, difficulty managing team members' productivity) are compared with hypothesis 16.

Managing conflict

Frequencies were significantly different between language difference and managing conflict, $X^2(16, N = 243) = 39.951, p = .001$, and managing conflict was found challenging (55.0%).

Establishing trust and relationship

Frequencies were not significantly different between language difference and establishing trust and relationship, $X^2(16, N = 243) = 20.401, p = .203$, and establishing trust and relationship was found very challenging (54.8%).

Having an effective communication

Frequencies were not significantly different between language difference and having an effective communication, $X^2(16, N = 243) = 17.708, p = .341$, and having an effective communication was found challenging (52.2%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between language difference and misunderstandings due to differences, $X^2(16, N = 243) = 25.860, p = .056$, and misunderstandings due to differences were found challenging (56.1%).

Meeting deadlines

Frequencies were not significantly different between language difference and meeting deadlines, $X^2(16, N = 243) = 15.117, p = .516$, and meeting deadlines were found challenging (41.3%).

Difficulty in leading teams remotely

Frequencies were not significantly different between language difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 12.169, p = .732$, and difficulty in leading teams remotely was found challenging (43.4%).

Difficulty managing team members' productivity

Frequencies were not significantly different between language difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 20.988, p = .179$, and difficulty managing team members' productivity was found challenging (43.8%).

H17: Cultural difference has a moderately negative effect on the formal mutual coherence.

The sample included 417 respondents. In H17, an association between cultural difference and effect on the formal mutual coherence was observed $X^2(5, N = 417) = 270.986, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. It is expected that cultural difference has a moderately negative effect on the formal mutual coherence. According to the responses the variables are associated with each other and cultural difference has no effect on the formal mutual coherence. Thus, H17 is not supported.

Answer	Count	Percentage
Highly positive (A1)	13	5.26%
Moderately positive (A2)	68	27.53%
No effect (A3)	86	34.82%
Moderately negative (A4)	75	30.36%
Highly negative (A5)	3	1.21%
No answer	2	0.81%

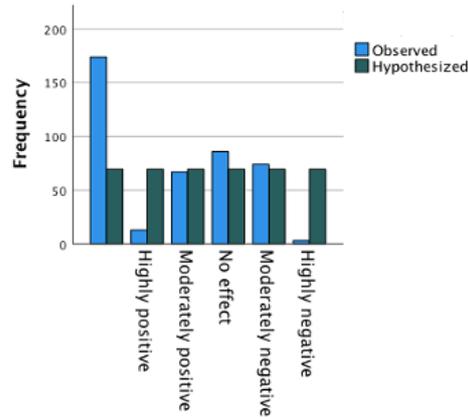


Figure 40. Relationship between cultural difference and formal mutual coherence

❖ Different cases for H17 and Challenges

➤ Roles:

Cultural difference is compared with the roles of the participants and the frequencies of participants are not differ by their role except Project Manager. H17 - Project Leader/Coordinator: $X^2(4, N = 243) = 1.708, p = .789$, H17 - Project Manager: $X^2(4, N = 243) = 10.393, p = .034$, H17 - Team Member: $X^2(4, N = 243) = 4.664, p = .324$, H17 - Researcher: $X^2(4, N = 243) = 1.248, p = .870$. Thus, these frequencies were not significantly different. Graphs are shown in Appendix 59.

➤ Cultural Diversity:

A chi-square test was conducted to understand the impact of cultural diversity within the team, on the effectiveness of the formal mutual coherence. Graphs are shown in Appendix 60.

There is no cultural diversity within the team

Frequencies were not significantly different, $X^2(4, N = 243) = 6.179, p = .186$, and if there is no cultural diversity within the team it has a moderately negative effect on the formal mutual coherence.

There is a small mix of cultural diversity within the team

Frequencies were not significantly different, $X^2(4, N = 243) = 8.605, p = .072$, and if there is a small mix of cultural diversity within the team it has no effect on the formal mutual coherence.

There is a remarkable degree of cultural diversity within the team

Frequencies were significantly different, $X^2(4, N = 243) = 9.590, p = .048$, and if there is a remarkable degree of cultural diversity within the team it has a moderately negative effect on the formal mutual coherence.

The team is 100 % culturally diverse

Frequencies were not significantly different, $X^2(4, N = 243) = 2.299$, $p = .681$, and if the team is 100 % culturally diverse, it has no effect on the formal mutual coherence.

Comparing the Challenges with Hypothesis 17:

Graphs are shown in Appendix 61 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having an effective communication, misunderstandings due to differences in culture, language, meeting deadlines, difficulty in leading teams remotely, difficulty managing team members' productivity) are compared with hypothesis 17.

Managing conflict

Frequencies were not significantly different between cultural difference and managing conflict, $X^2(16, N = 243) = 15.578$, $p = .483$, and managing conflict was found challenging (38.8%).

Establishing trust and relationship

Frequencies were not significantly different between cultural difference and establishing trust and relationship, $X^2(16, N = 243) = 15.932$, $p = .458$, and establishing trust and relationship was found challenging (37.7%).

Having an effective communication

Frequencies were not significantly different between cultural difference and having an effective communication, $X^2(16, N = 243) = 15.423$, $p = .494$, and having an effective communication was found very challenging (39.7%).

Misunderstandings due to differences in culture, language

Frequencies were significantly different between cultural difference and misunderstandings due to differences, $X^2(16, N = 243) = 32.592$, $p = .008$, and misunderstandings due to differences were found very challenging (35.9%).

Meeting deadlines

Frequencies were not significantly different between cultural difference and meeting deadlines, $X^2(16, N = 243) = 18.593$, $p = .290$, and meeting deadlines were found challenging (37.3%).

Difficulty in leading teams remotely

Frequencies were not significantly different between cultural difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 25.515$, $p = .061$, and difficulty in leading teams remotely was found very challenging (40.8%).

Difficulty managing team members' productivity

Frequencies were not significantly different between cultural difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 16.649$, $p = .409$, and difficulty managing team members' productivity was found very challenging (45.0%).

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H18: Trust has a moderately positive effect on the formal mutual coherence.

The sample included 417 respondents. In H18, an association between trust and effect on the formal mutual coherence was observed $X^2(5, N = 417) = 295.820, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. The variables are associated with each other and trust has a moderately positive effect on the formal mutual coherence.

Answer	Count	Percentage
Highly positive (A1)	57	23.08%
Moderately positive (A2)	116	46.96%
No effect (A3)	50	20.24%
Moderately negative (A4)	20	8.10%
Highly negative (A5)	2	0.81%
No answer	2	0.81%

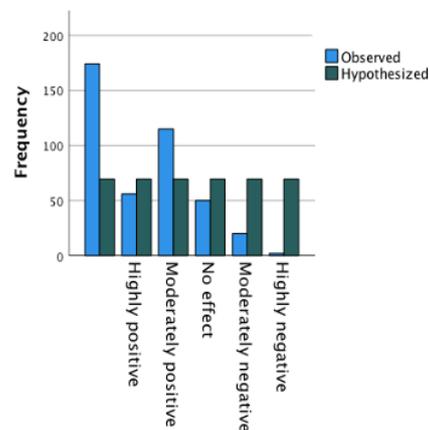


Figure 41. Relationship between trust and formal mutual coherence

❖ Different cases for H18 and Challenges

➤ Roles:

Trust is compared with the roles of the participants and the frequencies of participants are not differ by their role. H18 - Project Leader/Coordinator: $X^2(4, N = 243) = 3.532, p = .473$, H18 - Project Manager: $X^2(4, N = 243) = .683, p = .953$, H18 - Team Member: $X^2(4, N = 243) = .803, p = .938$, H18 - Researcher: $X^2(4, N = 243) = 6.222, p = .183$. Thus, these frequencies were not significantly different. Graphs are shown in Appendix 62.

Comparing the Challenges with Hypothesis 18:

Graphs are shown in Appendix 63 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having an effective communication, misunderstandings due to differences in culture, language, meeting deadlines, difficulty in leading teams remotely,

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difficulty managing team members' productivity, partners/members who do not participate meetings) are compared with hypothesis 18.

Managing conflict

Frequencies were not significantly different between trust and managing conflict, $X^2(16, N = 243) = 11.554$, $p = .774$, and managing conflict was challenging (52.5%).

Establishing trust and relationship

Frequencies were not significantly different between trust and establishing trust and relationship, $X^2(16, N = 243) = 23.905$, $p = .092$, and establishing trust and relationship was found challenging (55.1%).

Having an effective communication

Frequencies were significantly different between trust and having an effective communication, $X^2(16, N = 243) = 33.242$, $p = .007$, and having an effective communication was found challenging (49.3%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between trust and misunderstandings due to differences, $X^2(16, N = 243) = 8.963$, $p = .915$, and misunderstandings due to differences were found very challenging (47.4%).

Meeting deadlines

Frequencies were not significantly different between trust and meeting deadlines, $X^2(16, N = 243) = 9.472$, $p = .893$, and meeting deadlines were found challenging (48.0%).

Difficulty in leading teams remotely

Frequencies were not significantly different between trust and difficulty in leading teams remotely, $X^2(16, N = 243) = 19.985$, $p = .221$, and difficulty in leading teams remotely was found challenging (44.7%).

Difficulty managing team members' productivity

Frequencies were not significantly different between trust and difficulty managing team members' productivity, $X^2(16, N = 243) = 18.044$, $p = .321$, and difficulty managing team members' productivity was found challenging (48.8%).

Partners/members who do not participate meetings

Frequencies were not significantly different between trust and partners/members who do not participate meetings, $X^2(16, N = 243) = 11.053$, $p = .806$, and partners/members who do not participate meetings were found very challenging (45.0%).

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H19: Time difference has a moderately negative effect on the formal mutual coherence.

The sample included 417 respondents. In H19, an association between time difference and effect on the formal mutual coherence was observed $X^2(5, N = 417) = 291.619, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. The variables are associated with each other and time difference has a moderately negative effect on the formal mutual coherence.

Answer	Count	Percentage
Highly positive (A1)	9	3.64%
Moderately positive (A2)	38	15.38%
No effect (A3)	88	35.63%
Moderately negative (A4)	100	40.49%
Highly negative (A5)	10	4.05%
No answer	2	0.81%

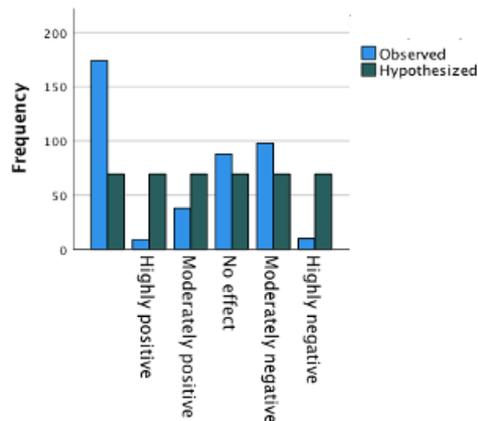


Figure 42. Relationship between time difference and formal mutual coherence

❖ Different cases for H19 and Challenges

➤ You are NOT in the same time zone:

Graphs are shown in Appendix 64 with the explanations

Virtual team members are speaking the same language and working at the same company

There was not a significant difference between the same language and same company cases, $X^2(4, N = 106) = 7.342, p = .119$, virtual team members who are speaking the same language and working at the same company rated that time difference has a moderately negative effect on the formal mutual coherence.

Virtual team members are speaking the same language but NOT working at the same company

There was not a significant difference between the same language and different company cases, $X^2(4, N = 106) = 1.367, p = .850$, virtual team members who are speaking the same language and working at different company rated that time difference has a moderately negative effect on the formal mutual coherence.

Virtual team members are NOT speaking the same language and working at the same company

There was not a significant difference between the different language and same company cases, $X^2(4, N = 106) = 6.353, p = .174$, virtual team members who are speaking the different language and working at the same company rated that time difference has a moderately negative effect on the formal mutual coherence.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was not a significant difference between the different language and different company cases, $X^2(4, N = 106) = 4.460, p = .484$, virtual team members who are speaking the different language and working at different company rated that time difference has a moderately negative effect on the formal mutual coherence.

Comparing the Challenges with Hypothesis 19:

Graphs are shown in Appendix 65 with the explanations. Challenges (e.g., managing conflict, having an effective communication,) are compared with hypothesis 19.

Managing conflict

Frequencies were not significantly different between time difference and managing conflict, $X^2(16, N = 243) = 23.488, p = .101$, and managing conflict was found very challenging (35.7%).

Having an effective communication

Frequencies were significantly different between time difference and having an effective communication, $X^2(16, N = 243) = 30.133, p = .017$, and having an effective communication was found very challenging (35.2%).

7.4.2.4 The Impact of Virtual Team Influencing Factors on the Informal Mutual Coherence

H20: Distance has a moderately negative effect on the informal mutual coherence.

The sample included 417 respondents. In H20, an association between distance and effect on the informal mutual coherence was observed $X^2(5, N = 417) = 271.906, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our

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variables are independent in the entire population and the result is significant. It is expected that distance has a moderately negative effect on the informal mutual coherence. According to the responses the variables are associated with each other and distance has no effect on the informal mutual coherence. Thus, H20 is not supported.

Answer	Count	Percentage
Highly positive (A1)	11	4.45%
Moderately positive (A2)	47	19.03%
No effect (A3)	98	39.68%
Moderately negative (A4)	77	31.17%
Highly negative (A5)	12	4.86%
No answer	2	0.81%

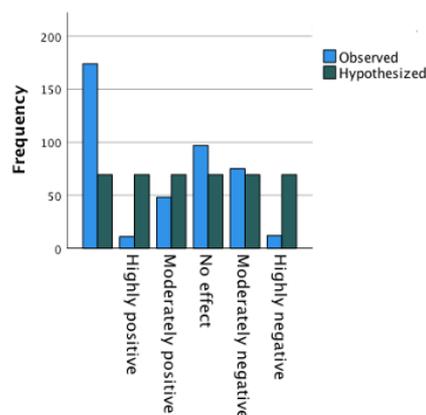


Figure 43. Relationship between distance and informal mutual coherence

❖ Different cases for H20 and Challenges

➤ You are in the same time zone but NOT in the same country:

Distance is compared between the same time zone different country cases. Graphs are shown in Appendix 66 with the explanations.

Virtual team members are speaking the same language and working at the same company

There was not a significant difference between distance, same language and same company cases, $X^2(2, N = 14) = 2.363, p = .307$, virtual team members who are speaking the same language and working at the same company rated that distance has a moderately negative effect on the informal mutual coherence.

Virtual team members are speaking the same language but NOT working at the same company

There was not a significant difference between the same language, different company and distance cases, $X^2(2, N = 14) = 1.379, p = .502$, virtual team members who are speaking the

same language and working at different company rated that distance has a moderately negative effect on the informal mutual coherence.

Virtual team members are NOT speaking the same language and working at the same company

There was not a significant difference between different language, same company and distance cases, $X^2(2, N = 14) = .636, p = .727$, virtual team members who are speaking different language and working at the same company rated that distance has no effect on the informal mutual coherence.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was not a significant difference between different language, different company and distance cases, $X^2(2, N = 14) = 4.200, p = .122$, virtual team members who are speaking different language and working at different company rated that distance has no effect on the informal mutual coherence.

➤ You are NOT in the same time zone:

Distance is compared with different time zone case. Graphs are shown in Appendix 67 with the explanations.

Virtual team members are speaking the same language and working at the same company

There was not a significant difference between same language, same company and distance cases, $X^2(4, N = 106) = 8.068, p = .089$, virtual team members who are speaking same language and working at the same company rated that distance has a moderately negative effect on the informal mutual coherence.

Virtual team members are speaking the same language but NOT working at the same company

There was not a significant difference between same language, different company and distance cases, $X^2(4, N = 106) = 7.595, p = .108$, virtual team members who are speaking same language and working at different company rated that distance has no effect on the informal mutual coherence.

Virtual team members are NOT speaking the same language and working at the same company

There was not a significant difference between different language, same company and distance cases, $X^2(4, N = 106) = 3.817, p = .431$, virtual team members who are speaking different language and working at the same company rated that distance has no effect on the informal mutual coherence.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was not a significant difference between different language, different company and distance cases, $X^2(4, N = 106) = 8.299, p = .081$, virtual team members who are speaking different language and working at different company rated that distance has a moderately negative effect on the informal mutual coherence.

➤ **Roles:**

Distance is compared with the roles of the participants and the frequencies of participants are not differ by their role. H20 - Project Leader/Coordinator: $X^2(4, N = 243) = 2.331, p = .675$, H20 - Project Manager: $X^2(4, N = 243) = 8.164, p = .086$, H20 - Team Member: $X^2(4, N = 243) = 5.494, p = .240$, H20 - Researcher: $X^2(4, N = 243) = 3.738, p = .443$. Thus, these frequencies were not significantly different. Graphs are shown in Appendix 68.

Comparing the Challenges with Hypothesis 20:

Graphs are shown in Appendix 69 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having an effective communication, time zones, misunderstandings due to differences in culture, language, loss of productivity due to the IT problems, presenting ideas during meetings, difficulty in leading teams remotely, technical and/or cost issues, meeting deadlines, adhering to agenda) are compared with hypothesis 20.

Managing conflict

Frequencies were not significantly different between distance and managing conflict, $X^2(16, N = 243) = 26.061, p = .053$, and managing conflict was found very challenging (35.1%).

Establishing trust and relationship.

Frequencies were not significantly different between distance and establishing trust and relationship, $X^2(16, N = 243) = 18.313, p = .306$, and establishing trust and relationship was found challenging (30.9%).

Having an effective communication

Frequencies were significantly different between distance and having an effective communication, $X^2(16, N = 243) = 32.103, p = .010$, and having an effective communication was found very challenging (35.1%).

Time zones

Frequencies were not significantly different between distance and time zones, $X^2(16, N = 243) = 23.594, p = .099$, and time zones were found challenging (29.9%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between distance and misunderstandings due to differences, $X^2(16, N = 243) = 17.607, p = .347$, and misunderstandings due to differences were found challenging (29.9%).

Loss of productivity due to the IT problems

Frequencies were not significantly different between distance and loss of productivity due to the IT problems, $X^2(16, N = 243) = 24.462, p = .080$, and loss of productivity due to the IT problems were found challenging (32.0%).

Presenting ideas during meetings

Frequencies were significantly different between distance and presenting ideas during meetings, $X^2(16, N = 243) = 27.949, p = .032$, and presenting ideas during meetings was found challenging (32.0%).

Difficulty in leading teams remotely

Frequencies were not significantly different between distance and difficulty in leading teams remotely, $X^2(16, N = 243) = 18.035, p = .322$, and difficulty in leading teams remotely was found challenging (35.1%).

Technical and/or cost issues

Frequencies were not significantly different between distance and technical and/or cost issues, $X^2(16, N = 243) = 25.188, p = .067$, and technical and/or cost issues were found challenging (28.9%).

Meeting deadlines

Frequencies were not significantly different between distance and meeting deadlines, $X^2(16, N = 243) = 18.773, p = .281$, and meeting deadlines were found challenging (38.1%).

Adhering to agenda

Frequencies were significantly different between distance and adhering to agenda, $X^2(16, N = 243) = 33.418, p = .007$, and adhering to agenda was found challenging (35.1%).

H21: Language difference has a moderately negative effect on the informal mutual coherence. The sample included 417 respondents. In H21, an association between language difference and effect on the informal mutual coherence was observed $X^2(5, N = 417) = 282.381, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. The variables are associated with each other and language difference has a moderately negative effect on the informal mutual coherence.

Answer	Count	Percentage
Highly positive (A1)	13	5.26%
Moderately positive (A2)	41	16.60%
No effect (A3)	81	32.79%
Moderately negative (A4)	101	40.89%
Highly negative (A5)	9	3.64%
No answer	2	0.81%

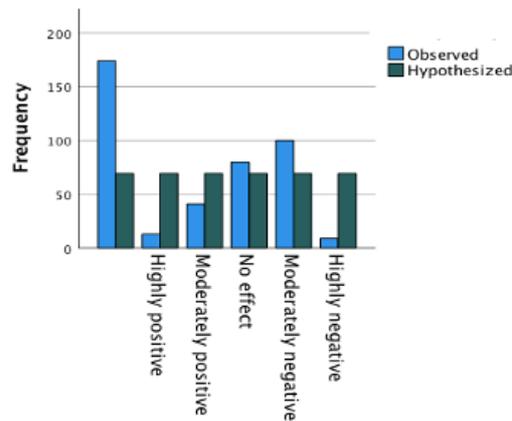


Figure 44. Relationship between language difference and informal mutual coherence

❖ Different cases for H21 and Challenges

➤ You are in the same time zone and working at the same country:

Language difference is compared between the same time zone same country cases. Graphs are shown in Appendix 70 with the explanations.

Virtual team members are NOT speaking the same language and working at the same company

There was no significant difference between different language, same company and language difference, $X^2(4, N = 123) = 1.827, p = .767$, virtual team members who are speaking different language and working at the same company rated that language difference has a moderately negative effect on the informal mutual coherence.

➤ You are in the same time zone but NOT in the same country:

Language difference is compared between the same time zone different country cases. Graphs are shown in Appendix 71 with the explanations.

Virtual team members are NOT speaking the same language and working at the same company

There was no significant difference between different language, same company and language difference, $X^2(2, N = 14) = .306, p = .858$, virtual team members who are speaking different

language and working at the same company rated that language difference has a moderately negative effect on the informal mutual coherence.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was no significant difference between different language, different company and language difference, $X^2(2, N = 14) = 2.703$, $p = .259$, virtual team members who are speaking different language and working at different company rated that language difference has a moderately negative effect on the informal mutual coherence.

➤ **You are NOT in the same time zone.**

Language difference is compared with the different time zone case. Graphs are shown in Appendix 72 with the explanations.

Virtual team members are NOT speaking the same language and working at the same company

There was no significant difference between different language and the same company, $X^2(4, N = 106) = 5.841$, $p = .211$, virtual team members who are speaking different language and working at the same company rated that language difference has no effect on the informal mutual coherence.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was no significant difference between different language and the different company, $X^2(4, N = 106) = 6.850$, $p = .144$, virtual team members who are speaking different language and working at different company rated that language difference has a moderately negative effect on the informal mutual coherence.

Comparing the Challenges with Hypothesis 21:

Graphs are shown in Appendix 73 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having an effective communication, misunderstandings due to differences in culture, language, presenting ideas during meetings, difficulty managing team members' productivity, adhering to agenda) are compared with hypothesis 21.

Managing conflict

Frequencies were not significantly different between language difference and managing conflict, $X^2(16, N = 243) = 22.750$, $p = .121$, and managing conflict was found very challenging (34.0%).

Establishing trust and relationship

Frequencies were significantly different between language difference and establishing trust and relationship, $X^2(16, N = 243) = 26.906, p = .043$, and establishing trust and relationship was found challenging (31.0%).

Having an effective communication

Frequencies were not significantly different between language difference and having an effective communication, $X^2(16, N = 243) = 24.819, p = .073$, and having an effective communication was found challenging (30.0%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between language difference and misunderstandings due to differences, $X^2(16, N = 243) = 13.301, p = .651$, and misunderstandings due to differences were found very challenging (32.0%).

Presenting ideas during meetings

Frequencies were significantly different between language difference and presenting ideas during meetings, $X^2(16, N = 243) = 29.427, p = .021$, and presenting ideas during meetings were found challenging (32.0%).

Difficulty managing team members' productivity

Frequencies were not significantly different between language difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 22.488, p = .128$, and difficulty managing team members' productivity was found challenging (45.0%).

Adhering to agenda

Frequencies were significantly different between language difference and adhering to agenda, $X^2(16, N = 243) = 26.327, p = .050$, and adhering to agenda was found challenging (31.0%).

H22: Cultural difference has a moderately negative effect on the informal mutual coherence.

The sample included 417 respondents. In H22, an association between cultural difference and effect on the informal mutual coherence was observed $X^2(5, N = 417) = 258.871, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. It is expected that cultural difference has a moderately negative effect on the informal mutual coherence. According to the responses the variables are associated with each other and cultural difference has no effect on the informal mutual coherence. Thus, H22 is not supported.

Answer	Count	Percentage
Highly positive (A1)	19	7.69%
Moderately positive (A2)	65	26.32%
No effect (A3)	91	36.84%
Moderately negative (A4)	64	25.91%
Highly negative (A5)	6	2.43%
No answer	2	0.81%

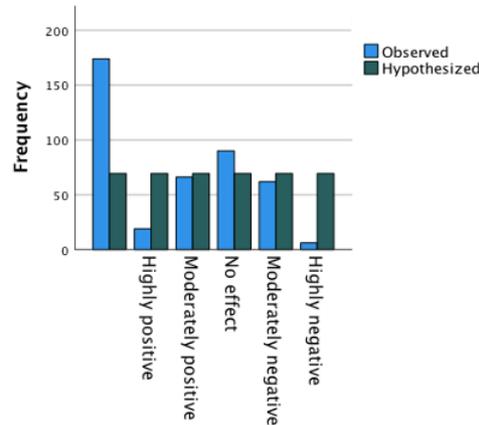


Figure 45. Relationship between cultural difference and informal mutual coherence

❖ Different cases for H22 and Challenges

➤ Roles:

Cultural difference is compared with the roles of the participants and the frequencies of participants are not differ by their role except Project Manager. H22 - Project Leader/Coordinator: $X^2(4, N = 243) = 1.792, p = .774$, H22 - Project Manager: $X^2(4, N = 243) = 10.956, p = .027$, H22 - Team Member: $X^2(4, N = 243) = 5.345, p = .254$, H22 - Researcher: $X^2(4, N = 243) = 4.400, p = .355$. Thus, these frequencies were not significantly different. Graphs are shown in Appendix 74.

Comparing the Challenges with Hypothesis 22:

Graphs are shown in Appendix 75 with the explanations. Challenges (e.g., establishing trust and relationship, having an effective communication, misunderstandings due to differences in culture, language, difficulty in leading teams remotely, difficulty managing team members' productivity) are compared with hypothesis 22.

Establishing trust and relationship

Frequencies were not significantly different between cultural difference and establishing trust and relationship, $X^2(16, N = 243) = 17.605, p = .348$, and establishing trust and relationship was found challenging (30.0%).

Having an effective communication

7 Data Analysis

Frequencies were not significantly different between cultural difference and having an effective communication, $X^2(16, N = 243) = 24.741, p = .075$, and having an effective communication was found very challenging (34.4%).

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between cultural difference and misunderstandings due to differences, $X^2(16, N = 243) = 14.612, p = .553$, and misunderstandings due to differences were found very challenging (33.3%).

Difficulty in leading teams remotely

Frequencies were significantly different between cultural difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 31.323, p = .012$, and difficulty in leading teams remotely was found challenging (37.8%).

Difficulty managing team members' productivity

Frequencies were not significantly different between cultural difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 23.838, p = .093$, and difficulty managing team members' productivity was found challenging (41.1%).

H23: Trust has a moderately positive effect on the informal mutual coherence.

The sample included 417 respondents. In H23, an association between trust and effect on the informal mutual coherence was observed $X^2(5, N = 417) = 284.281, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. The variables are associated with each other and trust has a moderately positive effect on the informal mutual coherence.

Answer	Count	Percentage
Highly positive (A1)	58	23.48%
Moderately positive (A2)	112	45.34%
No effect (A3)	44	17.81%
Moderately negative (A4)	30	12.15%
Highly negative (A5)	1	0.40%
No answer	2	0.81%

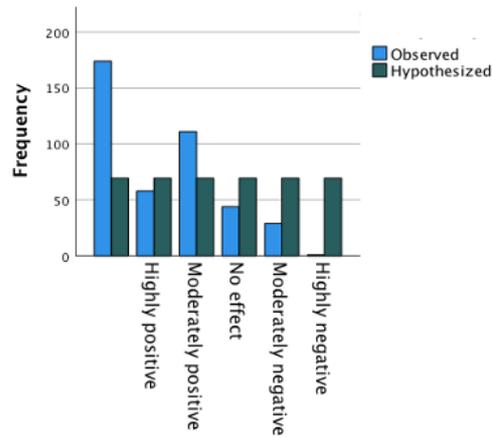


Figure 46. Relationship between trust and informal mutual coherence

❖ Different cases for H23 and Challenges

➤ Roles:

Trust is compared with the roles of the participants and the frequencies of participants are not differ by their role. H23 - Project Leader/Coordinator: $X^2(4, N = 243) = .947, p = .918$, H23 - Project Manager: $X^2(4, N = 243) = 1.792, p = .774$, H23 - Team Member: $X^2(4, N = 243) = 2.493, p = .646$, H23 - Researcher: $X^2(4, N = 243) = 7.201, p = .126$. Thus, these frequencies were not significantly different. Graphs are shown in Appendix 76.

Comparing the Challenges with Hypothesis 23:

Graphs are shown in Appendix 77 with the explanations. Challenges (e.g., managing conflict, establishing trust and relationship, having an effective communication, meeting deadlines, difficulty in leading teams remotely, difficulty managing team members' productivity) are compared with hypothesis 23.

Managing conflict

Frequencies were not significantly different between trust and managing conflict, $X^2(16, N = 243) = 15.636, p = .479$, and managing conflict was found very challenging (45.7%).

Establishing trust and relationship

Frequencies were not significantly different between trust and establishing trust and relationship, $X^2(16, N = 243) = 21.886, p = .147$, and establishing trust and relationship were found challenging (52.2%).

Having an effective communication

Frequencies were significantly different between trust and having an effective communication, $X^2(16, N = 243) = 37.051, p = .002$, and having an effective communication was found challenging (55.2%).

Meeting deadlines

Frequencies were not significantly different between trust and meeting deadlines, $X^2(16, N = 243) = 13.381, p = .645$, and meeting deadlines were found challenging (42.7%).

Difficulty in leading teams remotely

Frequencies were not significantly different between trust and difficulty in leading teams remotely, $X^2(16, N = 243) = 22.491, p = .128$, and difficulty in leading teams remotely was found challenging (47.4%).

Difficulty managing team members' productivity

Frequencies were significantly different between trust and difficulty managing team members' productivity, $X^2(16, N = 243) = 28.156, p = .030$, and difficulty managing team members' productivity was found challenging (52.5%).

H24: Time difference has a moderately negative effect on the informal mutual coherence.

The sample included 417 respondents. In H24, an association between time difference and effect on the informal mutual coherence was observed $X^2(5, N = 417) = 262.353, p = .000$. The probability is 0.00 in our case and the conclusion is we reject the null hypothesis that our variables are independent in the entire population and the result is significant. It is expected that time difference has a moderately negative effect on the informal mutual coherence. According to the responses the variables are associated with each other and time difference has no effect on the informal mutual coherence. Thus, H24 is not supported.

Answer	Count	Percentage
Highly positive (A1)	16	6.48%
Moderately positive (A2)	44	17.81%
No effect (A3)	93	37.65%
Moderately negative (A4)	79	31.98%
Highly negative (A5)	13	5.26%
No answer	2	0.81%

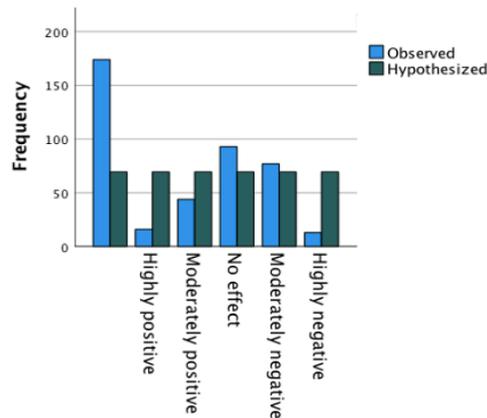


Figure 47. Relationship between time difference and informal mutual coherence

❖ **Different cases for H24:**

➤ **You are NOT in the same time zone**

Time difference is compared with different time zone case. Graphs are shown in Appendix 78 with the explanations.

Virtual team members are speaking the same language and working at the same company

There was a significant difference between same language, same company and time difference, $X^2(4, N = 106) = 9.828, p = .043$, virtual team members who are speaking the same language and working at the same company rated that language difference has a moderately negative effect on the informal mutual coherence.

Virtual team members are speaking the same language but NOT working at the same company

There was not a significant difference between same language, different company and time difference, $X^2(4, N = 106) = 1.234, p = .873$, virtual team members who are speaking the same language and working at different company rated that language difference has no effect on the informal mutual coherence.

Virtual team members are NOT speaking the same language and working at the same company

There was not a significant difference between different language, same company and time difference, $X^2(4, N = 106) = 2.906, p = .574$, virtual team members who are speaking the different language and working at the same company rated that language difference has a moderately negative effect on the informal mutual coherence.

Virtual team members are NOT speaking the same language and NOT working at the same company

There was not a significant difference between different language, different company and time difference, $X^2(4, N = 106) = 6.009, p = .198$, virtual team members who are speaking the different language and working at different company rated that language difference has a moderately negative effect on the informal mutual coherence.

Comparing the Challenges with Hypothesis 24:

Graphs are shown in Appendix 79 with the explanations. Challenges (e.g., establishing trust and relationship, having an effective communication, managing conflict, misunderstandings due to differences in culture, language, difficulty in leading teams remotely, difficulty managing team members' productivity) are compared with hypothesis 24.

Establishing trust and relationship

Frequencies were significantly different between time difference and establishing trust and relationship, $X^2(16, N = 243) = 27.133, p = .040$, and establishing trust and relationship were found challenging (43.5%).

Having an effective communication

Frequencies were significantly different between time difference and having an effective communication, $X^2(16, N = 243) = 28.345, p = .029$, and having an effective communication was found very challenging (45.2%).

Managing conflict

Frequencies were significantly different between time difference and managing conflict, $X^2(16, N = 243) = 31.268, p = .012$, and managing conflict was found challenging (47.5%).

Misunderstandings due to differences in culture, language, etc.

Frequencies were not significantly different between time difference and misunderstandings due to differences, $X^2(16, N = 243) = 11.123, p = .802$, and misunderstandings due to differences were found very challenging (37.2%).

Difficulty in leading teams remotely

Frequencies were significantly different between time difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 32.584, p = .008$, and difficulty in leading teams remotely was found challenging (39.5%).

Difficulty managing team members' productivity

Frequencies were significantly different between time difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 36.528, p = .002$, and difficulty managing team members' productivity was found challenging (48.8%).

7.5 Summary

The objective of this study is to investigate the relationship between trust, knowledge sharing, cultural difference, language difference, distance, and how this relationship affects the effectiveness of virtual teams. The results support most of the hypothesized relationships which are shown in Table 16.

Table 16. Summary of Hypotheses

Hypothesis	Supported
H1= Trust → Team effectiveness	Supported
H2= Knowledge sharing → Trust	Supported
H3= Knowledge sharing → Team effectiveness	Supported
H4= Cultural difference → Team effectiveness	Not Supported
H5= Language difference → Team effectiveness	Supported
H6= Distance → Team effectiveness	Not supported
H7= Time difference → Team effectiveness	Supported
H8= Distance → Effectiveness of standards	Not supported
H9= Language difference → Effectiveness of standards	Supported
H10= Trust → Effectiveness of standards	Supported
H11= Distance → Effectiveness of plans	Not supported
H12= Cultural difference → Effectiveness of plans	Not supported
H13= Trust → Effectiveness of plans	Supported
H14= Time difference → Effectiveness of plans	Supported
H15= Distance → Formal mutual coherence	Not supported
H16= Language difference → Formal mutual coherence	Supported
H17= Cultural difference → Formal mutual coherence	Not supported
H18= Trust → Formal mutual coherence	Supported
H19= Time difference → Formal mutual coherence	Supported
H20= Distance → Informal mutual coherence	Not supported
H21= Language difference → Informal mutual coherence	Supported
H22= Cultural difference → Informal mutual coherence	Not supported
H23= Trust → Informal mutual coherence	Supported
H24= Time difference → Informal mutual coherence	Not supported

The results show that trust and knowledge sharing have a positive effect on team effectiveness. Time difference and language difference have a negative effect on team effectiveness. Distance has no effect on team effectiveness and cultural differences have positive effect on team effectiveness, but this is not the expected result. Therefore, Hypotheses 4 and 6 are not supported.

7 Data Analysis

These indicators' relationship between the effectiveness of plans/standards, formal/informal mutual coherence is measured as well. The results show that trust has a positive effect on the effectiveness of standards, effectiveness of plans, formal mutual coherence, and informal mutual coherence. Language difference has a negative effect on the effectiveness of standards, formal mutual coherence, and informal mutual coherence.

Distance has no effect on the effectiveness of standards. That's why Hypothesis 8 is not supported. Further, distance and cultural difference have no effect on the effectiveness of plans, formal mutual coherence and informal mutual coherence, Therefore, Hypotheses 11, 12, 15, 17, 20, 22 are not supported. Finally, the time difference has a negative effect on team effectiveness, effectiveness of plans, formal mutual coherence but has no effect on informal mutual coherence. Therefore, Hypothesis 24 is not supported as well.

Consequently, according to this study virtual teams claim that trust and knowledge sharing have a positive impact on virtual team indicators and are crucial for virtual team efficiency.

8 Conclusions

The majority of the research on virtual teams has focused on the effectiveness of virtual teams. Virtual teams differ from collocated teams on several outcomes. Virtual teams communicate less frequently, completing tasks may take longer time than face-to-face teams. Additionally, a team staffing strategy is significant for virtual teams. Because team staffing strategy affects the task work and teamwork skills. Limited staffing strategy for virtual teams can increase the challenge of engaging in effective collaboration. Thus, staffing teams need to identify task experts who can also work together well as a team (Webber, 2002). The internet and electronic communication have made new ways of organizations which allows working together around the globe. Working collaboratively is important for virtual teams because virtual teams are more difficult to manage than collocated teams. Further, achieving high levels of performance is more difficult in virtual teams but effective collaboration strengthens the teamwork and increases the performance of virtual teams. Moreover, in virtual environments trust is the key success factor and drives performance. In order to develop trust, team members should follow commitments. Organizational culture, shared understanding, trust, and collaborative technology are important for effective collaboration. On the other hand, management is the key factor for virtual teams. Leaders should generate a common understanding among team members and should have coaching skills, virtual meeting skills, cultural sensitivity, and communication skills. Consequently, collaboration encourages team members and requires trust, shared understanding, and good relationships among team members (Beyerlein, 2002).

The research presented in this study investigates online collaboration in virtual teams and the impact of knowledge sharing, trust, cultural difference, language difference, distance, time difference on team effectiveness. Furthermore, the effects of virtual team issues on the effectiveness of plans, effectiveness of standards, formal mutual coherence, and informal mutual coherence are investigated. The results of the research model describe the hypothesized relationship between knowledge sharing, trust, cultural difference, language difference, distance, time difference, and team effectiveness in virtual team settings. The research model is tested with a survey. The results of this research support 5 hypotheses that explain the relationship between trust, knowledge sharing, language difference, time difference on team effectiveness. Additionally, the results support 9 hypotheses that define the relationship between trust, language difference, time difference on the effectiveness of standards, the effectiveness of plans, formal mutual coherence, and informal mutual coherence. The results of this research show a better understanding of the affecting factors of virtual team effectiveness.

8.1 Summary of Research Results & Discussion

The objective of this research is to investigate the impacts of virtual team issues such as trust, language difference, time difference, knowledge sharing, cultural difference, and distance on team effectiveness and the effectiveness of plans/standards and formal/informal mutual coherence. All virtual team issues and their impacts on team effectiveness were mapped which is shown in Table 17.

Table 17. Virtual Team Issues and Their Impacts on Team Effectiveness

Language difference	<ul style="list-style-type: none"> ➤ Difficulties to understand workplace norms, misinterpretations during group decisions.
Time difference	<ul style="list-style-type: none"> ➤ Difficulty in working multiple time zones. ➤ Misunderstanding about the time differences. ➤ Delays on the project.
Trust	<ul style="list-style-type: none"> ➤ Unpredictable communication methods, only a few members are in communication. ➤ Less productivity, more stress on the job.
Cultural difference	<ul style="list-style-type: none"> ➤ Difficulty to interact/communicate with one another. ➤ The difficulty about holidays across different locations of the team.
Knowledge sharing	<ul style="list-style-type: none"> ➤ Difficulty on company workflows and processes such as instant messaging service, tools, etc. ➤ Difficulty to use a central platform for all discussions and knowledge sharing (e.g., sharing documents, data, etc.). ➤ Difficulty in using communication project management tools (e.g., Jira, Slack, Trello, etc.).
Distance	<ul style="list-style-type: none"> ➤ Delayed response because of the distance. ➤ Nonverbal communication such as body language and mimics which are lost. ➤ Difficulty in using the collaboration tools such as video/audio chat apps, screen sharing, file sharing, etc.

According to my survey, the results show that trust and knowledge sharing has a positive effect on team effectiveness. Time difference and language difference have a negative effect on team effectiveness. Distance has no effect on team effectiveness and cultural differences have a positive effect on team effectiveness.

Contrary to my results, Aubert and Kelsey, 2003, focused on the ability of trust formation in virtual teams. According to their study, 71 business students from two Canadian universities took part in this study. The students were grouped into 11 virtual teams from both universities. They were asked to conduct a research project and submit a report at the end of the semester. However, they found that trust does not have a significant impact on team effectiveness.

8 Conclusions

Moreover, Pincas 2001 focused on the complexities brought by differences in linguistic cultures and hidden international education problems. It is argued that multi-cultural issues can cause many difficulties e.g., politeness, modes of emphasis, etc., which is the most difficult aspect of cross-cultural conversation. So, this study is discussing that cultural differences and language differences can have a negative impact on team performance. Consequently, according to my understanding, Pincas 2001, found that language differences may cause negative cross-cultural electronic communication. This study supported my findings of the language difference which has a negative effect on team effectiveness but did not support my findings of cultural differences. Another study from Tenzer et al., 2014, investigated how language differences influence trust formation in multicultural teams. In their research, they had 15 multicultural teams. 90 interviews with team members, team leaders, and senior managers in three German automotive corporations were done. Their research showed that language uniquely affects trust. Another study is related to knowledge sharing. The results found in the literature support my findings of knowledge sharing which has a positive impact on team effectiveness. Davidavičiūtė et al., 2020, focused on the effect of knowledge sharing in virtual teams in the Middle East. The companies in this research were based in the United Arab Emirates from the IT industry who were working remotely. The results showed that culture, motivation, communication technologies, trust, and leadership have a positive impact on knowledge sharing. These factors affect the knowledge sharing process therefore they should be considered in order to achieve effectiveness and to reach high virtual team performance.

Although my results showed that distance has no impact on team effectiveness, the literature showed that physical distance can cause difficulties to strengthen team cohesion, communication problems, and joint perception of goals. So, my research focused on geographical distance and it was found that it has no impact on team performance. On the other hand, if it is a temporal distance, it can cause difficulties to establish a predictable rhythm in work processes. According to my understanding, temporal distance is related to time differences. Because difficulty in a predictable rhythm means that team members are separated by time zone and the coordination of work processes that can be challenging since synchronous communication between the team members is very limited (Gärtner et al., 2020). According to my results, the time difference has a moderately negative effect on team effectiveness. But in the literature, (Sivunen et al., 2016) 93 interviews were done from four different organizations in Finland. They found that small-time differences can be even more challenging than large time differences and it may result in disruptive discontinuities in collaboration in global virtual teams.

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Furthermore, the impacts of virtual team issues such as trust, language difference, time difference, knowledge sharing, cultural difference, and distance on the effectiveness of plans/standards and on formal/informal mutual coherence were identified in this research. All virtual team issues and their impacts on effectiveness of plans/standards and on formal/informal mutual coherence were mapped which is shown in Table 18.

Table 18. Influencing factors on communication/coordination mechanisms (Standards, Plans, FMC and IMC)

Effectiveness of standards	Impacted by language difference and trust: <ul style="list-style-type: none"> ➤ Difficulties in following the development process. ➤ Difficulties to create/review project documentation. ➤ Difficulties in synchronization while working with different teams.
Effectiveness of plans	Impacted by trust and time difference: <ul style="list-style-type: none"> ➤ Difficulties in creating the project plan. ➤ Difficulties in using the software tools for the project. ➤ Difficulties in managing the project requirements and deadlines.
Effectiveness of formal mutual coherence (FMC)	Impacted by language difference, trust, and time difference: <ul style="list-style-type: none"> ➤ Difficulties on scheduled calls. ➤ Difficulties in communication and collaboration.
Effectiveness informal mutual coherence (IMC)	Impacted by language difference and trust: <ul style="list-style-type: none"> ➤ Difficulties on communication mechanisms such as emails, instant messages, phone calls, etc. ➤ Difficulties in building trust because of misunderstandings.

My research findings were compared to Kiely et al., 2010 findings in this part. Kiely et al., 2010, investigated the coordination mechanisms in virtual software development projects in Fortune 100 telecommunications manufacturers. Their study focused on a software development project in a multinational telecommunications manufacturer that global virtual teams develop a software sub-system. In addition to this, they explored the impacts of distance, trust, language difference, cultural difference, and time zone difference on global virtual team effectiveness.

According to my study, the research model proposes that the effectiveness of standards was impacted by virtual team issues which include distance, language difference, and trust. However, the findings indicate that the effectiveness of standards was impacted by language difference and trust. Language difference had a moderately negative impact and trust had a moderately positive impact on the effectiveness of standards, but the distance had no perceived

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impact on standards. Contrary to our expectations Kiely et al., 2010, found that distance has “a moderately negative impact on the effectiveness of standards”. The development manager mentioned that due to the geographic distance team members may have a high distrust with other team members in relation to project documentation and standards. However, our results showed that distance has no impact on the effectiveness of standards.

The effectiveness of plans was impacted by distance, cultural difference, trust, and time difference. However, results showed that cultural differences and trust had no impact on plans. Trust had a moderately positive impact on plans and time difference had a moderately negative impact on plans. But in contrast to our results, in the literature Kiely et al., 2010, found that trust, time difference, the cultural difference has “a high negative impact” and distance has “a moderately negative impact on the effectiveness of plans”. The development manager in their study mentioned that it was difficult to trust any team members in the initial stages of the work relationship which causes delays in the project. The time difference is another factor in the plans. The project manager stated that addressing project plan issues, deadlines, and questions that needed to be answered quickly were causing difficulties because team members were not available as they have holidays. As a result, due to the time differences team members were not available to take action. In addition to these factors, different cultural backgrounds cause difficulties on the project schedule and completion. Finally, distance is argued in this study. Due to the distance team members have to maintain project schedules, plans, and estimates. This means that at the beginning a lot of time is needed to plan project cycles.

The effectiveness of formal mutual coherence was impacted by distance, language difference, cultural difference, trust, and time difference. Language difference and time difference had a moderately negative impact and trust has a moderately positive impact on formal mutual coherence. Contrary to our expectations Kiely et al., 2010, found that time difference, language difference has “a high negative impact, trust has a moderately negative impact on the effectiveness of formal mutual coherence”. In this study, a development manager and systems engineer stated that usually one team or the others have to attend very early morning meetings or late night-time meetings. Due to these working hours, team members cannot perform their work efficiently. For the language difference, a software engineer mentioned that even if everyone speaks the same language in the meetings/calls it is difficult to understand each other because of the accent and pronunciation which can cause misunderstandings as well. Moreover, trust is another factor that needs to be taken into account. In this study, it is argued that building trust between team members took a longer period. Therefore, when members did not respond to emails, phone calls, or messages it would be more difficult to build/rebuild trust and work

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effectively together. Furthermore, according to our results, cultural difference and distance have no impact on formal mutual coherence but according to the literature (Kiely et al., 2010), the cultural difference has “a moderately negative impact” and distance has “a highly negative impact on the effectiveness of formal mutual coherence”. Senior software engineer in this study explained that cultural differences have impacts on how people communicate. Thus, in the calls some members, only listen, don't say anything, they don't provide any feedback. From my understanding, these problems occurred due to language and cultural differences. The development manager mentioned that communication problems were reported due to the distance. A key participant neither gave feedback nor spoke thus, it took longer to understand and solve the problem. Further, a software engineer stated that it is difficult to focus on specific technical issues due to the high usage of conference calls. To resolve these specific technical issues, they had to have one-to-one calls with team members.

According to the assumptions, informal mutual coherence was impacted by distance, language difference, cultural difference, trust, and time difference. Results showed that language difference had a moderately negative impact and trust had a moderately positive impact on informal mutual coherence. In contrast, it is found in the literature (Kiely et al., 2010), trust has “a moderately negative impact on the effectiveness of informal mutual coherence”. In our results, it is found that time difference, distance, and cultural difference have no effect on the effectiveness informal mutual coherence but in contrast to our results Kiely et al., 2010 found that distance has “a high negative impact, the cultural difference has a low negative impact and time difference have a high negative impact on effectiveness informal mutual coherence”. According to this study, it is mentioned that informal mutual coherence is significantly interrupted by distance as team members cannot have face-to-face meetings. Additionally, the time difference is minimizing the problem-solving interactions between team members. The senior development manager explained that even for an issue you need to wait another 24 hours because team members are located in three separate sites and you need a response from all of them. A software developer in this study stated that in virtual teams everyone is isolated therefore, it is harder to build trust between team members. Everybody should answer their phone, reply to emails or messages on time in order to build trust and to solve the issues. Finally, in this study culture is found to have a minor impact on informal mutual coherence which is supporting my results since my results showed that culture has no effect on informal mutual coherence.

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In conclusion, the results of this study showed the measures for the influencing factors on communication/coordination mechanisms. The revised model with associated hypotheses is shown in Figure 48 and 49.

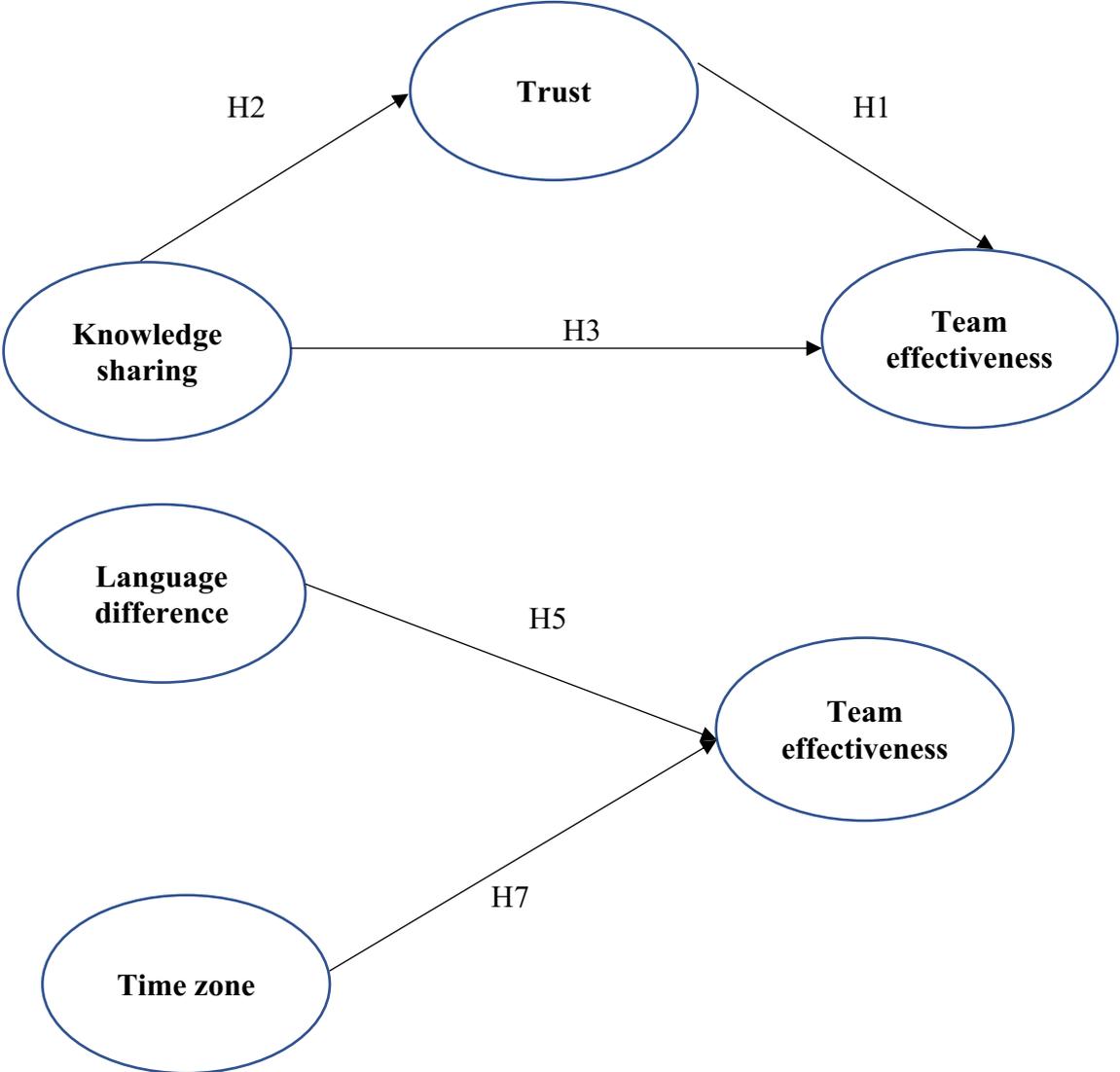


Figure 48. Revised model, relationship between virtual team influencing factors and team effectiveness (with associated hypotheses)

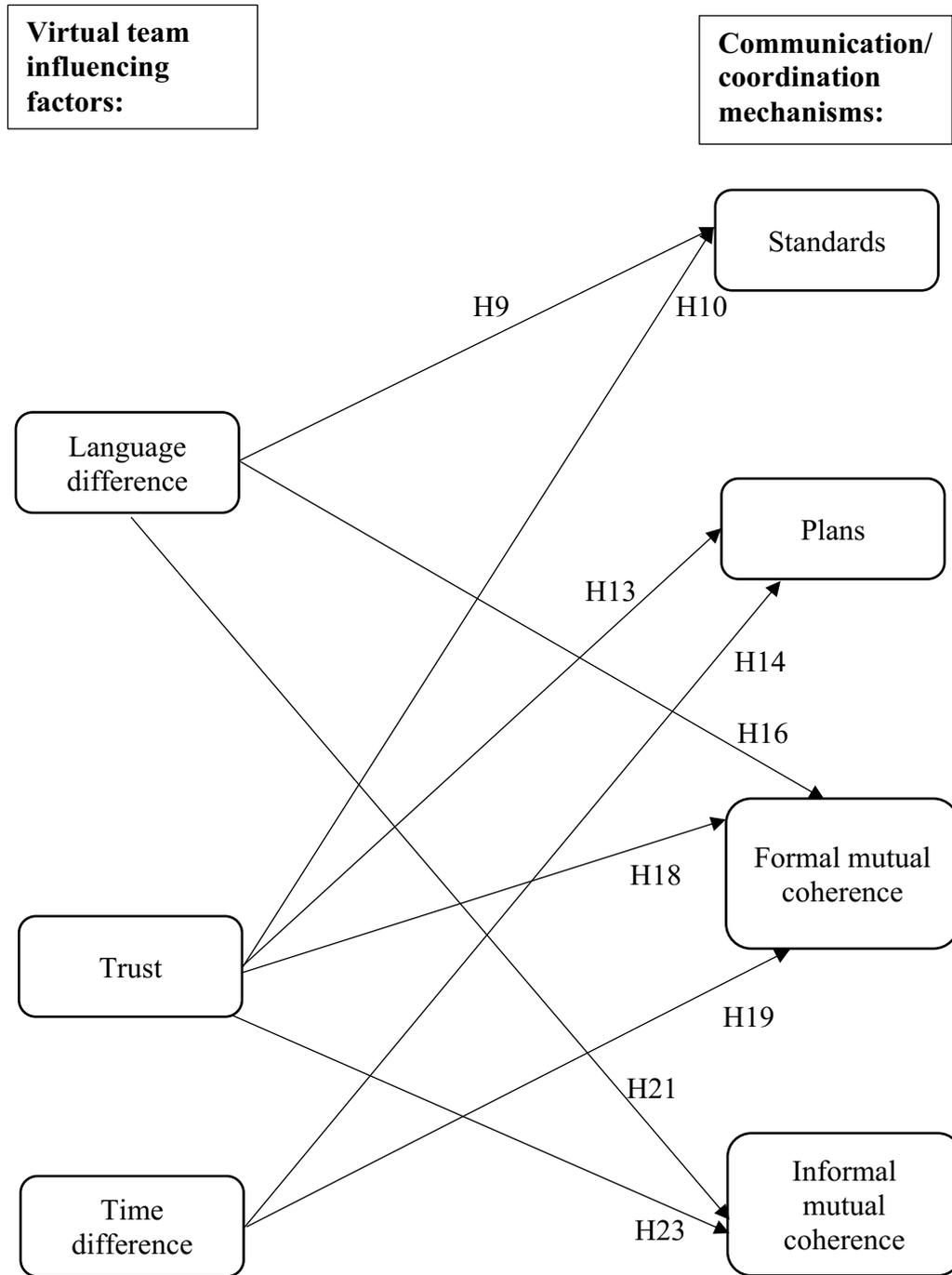


Figure 49. Revised model, relationship between virtual team influencing factors and coordination/communication mechanisms (with associated hypotheses)

As discussed in the previous sections, remote workforces can help businesses to grow faster because of their advantages such as cost efficiency, 24/7 presence, broader talent pool with

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different skills, and more productive employees. According to the results, it is possible to overcome these difficulties by understanding virtual team dynamics, building a reliable and open relationships with each other, and ensuring proper infrastructure for remote work. Thus, organizations need to describe the needs for virtual teams: i) Communication is essential for success therefore, obstacles should be removed for efficient communication. ii) Proper tools should be used for efficient collaboration between team members. iii) Everyone should be comfortable enough with each other. Language differences and cultural backgrounds can be an advantage for global development. iv) Trust should be built between the teams because employees with high trust can work more effectively. v) Right infrastructure should be used for the virtual team environment. Consequently, solving all these difficulties, understanding virtual team dynamics, building a reliable relationship between each other, using the right tools, and establishing the proper structure will help team members work more efficiently.

8.2 Results of Research Questions

All research questions are covered in this study. A very short overview of the research questions is given in this section.

1. What benefits and problems arise as a consequence of the creation of a virtual team?

This question is discussed in section 2. The advantages and disadvantages of virtual teams and face-to-face communication are defined. Virtual teams have benefits for organizations and their employees (Horvath and Tobin, 2001). The most significant benefit to the organization is the accessibility of knowledgeable employees. Organizations are able to hire the most skillful and knowledgeable people regardless of where they live. Additionally, virtual teams can reduce costs and office space and, an organization can save travel expenses. Employees also benefit from virtual teams. Organizations allow team members to move from one project to another without relocation. Employees can have increased job flexibility, independence, and confidence (Orvis and Zaccaro, 2008).

2. What are the challenges of virtual teams?

Six major challenges of virtual teams have been identified in section 3: distance, time difference, technology, cultural difference, trust, and leadership. Further, virtual teams have to deal with language barriers, cultural differences and some other specific problems in communication thus, common challenges are defined in this section as well.

3. What kind of methods virtual teams are using today and how effective are they?

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This question is discussed in section 4.9. Virtual teams use computer-supported communication technologies, such as email, instant messaging, and video or voice conferencing services to collaborate. There are different tools for video and web conferencing such as Go to meeting, Zoom, Google Meet, GlobalMeet, join.me, Free conference call, EasyWebinar, ClickMeeting, Cisco Webex Meetings, BlueJeans by Verizon, Google Hangouts, and task management applications such as Jira, Trello, ClickUp, Todoist. So, each tool has pros and cons therefore, organizations need to investigate which online collaboration tools would work best for the team.

4. What are the success factors for virtual teams?

Successful key factors are defined in section 4.12 in detail. It is found that virtual team members should have good communication skills, should be able to empathize, should be able to work independently, and should have a high-self responsibility.

5. What are the impacts of virtual team issues (trust, language difference, time difference, knowledge sharing, cultural difference, distance and on team performance and on the effectiveness of plans/standards and formal/informal mutual coherence?)

The results show that trust and knowledge sharing have a high positive impact on trust in virtual teams. This issue is defined in section 7 and proved that it has a high positive impact on trust and team effectiveness. Trust has a significant effect on team effectiveness. When trust is high in collaboration, team effectiveness is higher as well. This virtual team issue is discussed in section 7 and proved that it has a positive impact on team effectiveness. Time difference and language difference have a negative effect on team effectiveness. Distance and cultural differences have no effect on team effectiveness. All virtual team issues are defined in section 7. In section 8.1, these virtual team issues are discussed and a comparison between the survey results and the literature is done.

Consequently, these findings define the success factors in building and managing efficient global virtual teams. Efficient global virtual team outcomes include high team performance, trust, communication, collaboration, fast time to the market, high project success rate, low risks and failures, safer and healthier organizations.

8.3 Top Learnings and Recommendations

Organizations are increasingly using virtual teams, especially during COVID-19. Yet, little is known how the virtual team influencing factors impact virtual team members, their collaboration, and team effectiveness. This research proposed a model which hypothesized a relationship between virtual team influencing factors and team effectiveness.

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The results of this study have indications for both research and practice. For research, it provides new insights about the factors that affect virtual team effectiveness. In addition to this, because of COVID-19 more and more organizations started to work remotely. Thus, we identified the need for the future to better understand the impact of trust, knowledge sharing, cultural difference, language difference, distance, and time difference on virtual teams' outcomes. For practice, this research emphasizes the significance of virtual team influencing factors to virtual team effectiveness and recommends that organizations support virtual teams on both technological, organizational, and social levels.

In order to stay a safer organization, to reduce project failures and risks virtual team settings need to be implemented properly for IT projects. To help accomplish the building an effective virtual team the following recommendations are learned from this research:

- The participants in this study were mainly in the area of IT (21.82%) (because the survey was designed for IT projects), followed by education (16.55%) and consumer products industry (12.47%). But due to the COVID-19, there were many participants who participated in the survey who were working remotely from different industries (e.g., energy, psychology, marketing, tourism, psychology, health and science, environmental sciences, public relations, design, engineering, government services). For age, 81.06% of participants were from 34 and under years and 70.28% of participants were from Europe, 24.70% of participants were from Germany followed by the United Kingdom (25.66%). The rest of the participants were from all over the world (e.g., Israel, Poland, United States, Canada, Portugal, Russia, Australia, Taiwan, Mexico, Malaysia, Pakistan, India, China, United Arab Emirates, Ethiopia, Ireland, Latvia, Hungary, Japan, Pakistan, Thailand, Cyprus, Greece, Philippines, Saudi Arabia, Bulgaria, Romania, Norway, Indonesia, South Africa, Egypt). For the time spent working in virtual teams almost 88.47% of the members had joined in the last 5 years. 48.15% of the members had less than 1-year of experience in working remotely which was because of COVID-19. The diversity of membership in organizations showed that 13.58% of the participants were leaders and 10.70% were managers and the proportion of team members was approximately 52.67% of the participants and the team size was around 6-10 people (34.16%). Under normal conditions, some of the participants have worked in virtual and face-to-face so due to the COVID-19 they didn't have many adjustment problems because they were already working remotely before the pandemic approximately 4 years or more or even permanent (23.88%), please see Appendix 2 for details of respondents' demographics. In addition to these, according to my personal

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experience and my personal conversation with my colleagues, I found that most of the people were very interested in continuing working in virtual environments or in mixed mode (virtually and face-to-face) in a new post COVID-19 normality.

- Global virtual teams bring additional risks therefore it is very important to be aware of the challenges in virtual teams (e.g., trust, knowledge sharing, cultural difference, language difference, distance, and time difference) and find appropriate solutions for the problems.
- In virtual teams it is important to get to know each other. Building trust and communication, learning each other's experiences and skills will enable team members to confidence and success in the project.
- Trust is considered as one of the most important variables especially because of the increase in remote work during COVID-19. Companies should give greater importance to trust which strengthens communication, collaboration, cohesion, and team efficiency.
- Establish strong trust and communication among team members. Setting regular phone or video conference meetings will promote communication and help build trust within the team.
- Select the manager/leader with appropriate leadership skills such as working across boundaries and using technology effectively. Depending on the level of experience and skills, empowering the team members is vital in IT projects.
- Select the team member with good communication and relevant skills about the project.
- Define the project goals, roles, and responsibilities very clearly. The specifications of requirements of the projects are very clear from the beginning, especially with Agile methodologies. Therefore, it is possible to structure the IT projects in an orderly manner.
- Create an effective mechanism for knowledge sharing and knowledge management that can be accessible to all team members at any time. Knowledge sharing and learning are significant in virtual teams thus they should be actively encouraged by organizations and team leaders/managers. Moreover, processes, ideas, case studies, success stories, etc., should be written and reachable to everyone in the team. Also, team members should be encouraged to share their knowledge by writing blogs, articles, or presentations for others.
- Establish conflict management processes.
- Provide training programs to help team members and to improve their skills. Training the team members will be more important in the coming years because of the increase in remote work due to the COVID-19.

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- Keep the interests and goals of the team at the top.
- Prepare the agenda, share with the teams on time and respect the agenda.
- Closely track the project progress with weekly or bi-weekly meetings.
- Give feedback on time and encourage team members' responsibility and visibility for their actions.
- There is a risk that virtual team members may not report properly, therefore establishing the reporting structure of the project.
- Risk management should be integrated into the project and risks should be reported.

Today's IT tools are very effective for virtual collaboration. Virtual teams usually use Google Docs, Google Hangout, Zoom, Microsoft Teams, Basecamp, etc., and desktop sharing to show what they are working on. These tools enable the teams to work parallel on a project. On the other hand, by using these tools, sequential teamwork is also possible for virtual teams. Despite the advantages of these IT tools, some team members cannot use the tools efficiently or properly. Therefore, it is important to give training to the teams or to train each other internally to ensure everyone is at the same level before the actual work starts. This approach will help virtual teams to be more effective and the project does not get delayed because of technological problems.

Furthermore, in virtual teams, team members can be gathered from different cultures. Cultural differences can create obstacles such as intercultural difficulties, misunderstandings, miscommunication, which can hinder the knowledge sharing process, and building trust, or vice versa may lead to greater team success that can broaden the teams' perspective, thus enhancing the team's creativity. Although virtual teams provide organizations to integrate skills from all over the world, the cultural differences may add difficulty to the relationships between the teams and team members and the collaboration, communication, knowledge sharing, and building trust. Culture is the most crucial boundary in virtual teams. Cultural differences and their effect can be divided into two categories; i) task-specific processes and ii) socioemotional processes. Tasks-specific processes refer to the tasks where the team achieves a goal, socioemotional processes refer to team members' focus toward building trust, communication/collaboration, team cohesion, and social integration. As a result, cultural differences include beliefs, norms, preferences, which can create difficulties in cultural interactions, miscommunication, misunderstandings, and knowledge sharing. Furthermore, teams from different cultures show low performance due to the difference in the team members' beliefs and values, which creates cultural complexity and may negatively affect team effectiveness (Davidavičienė et al., 2020). On the other hand, if cultural diversity is well

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managed, it can be an advantage for the team, but otherwise, it may hinder team performance. In the studies, cultural differences usually emphasized the negative impacts on team efficiency. In contrast, it is necessary to manage a positive approach to cultural differences to increase the benefits of cultural diversity. Because cultural diversity has advantages, and organizations can use the creative side of teams and different perspectives to be more effective (Han and Beyerlein, 2014). As a result, despite negative factors, results showed that team members from different cultures look at problems from a different angle, and problems are addressed differently. Also, in the survey results, it is found that cultural differences have a positive impact on team effectiveness. Thus, cultural differences may lead to greater team success.

Consequently, trust, knowledge sharing, shared understanding, shared goals and good communication greatly help virtual teams perform better. Therefore, teams need to find a way to build virtual team efficiency affecting factors. A face-to-face meeting is helpful but not required. Results showed that team members can manage to work, communicate and finish the project successfully in a virtual environment. So, it is possible to work fully virtual. Also, participants agreed on distance has no effect on virtual team efficiency. Thus, if face-to-face communication is not possible, regular meetings via phone or video/audio conferencing can be set. By using these communication tools, it is possible to help teams to work the same as if they were working in a traditional team setting. The results, therefore, show that the increased remote work by COVID-19 can be an opportunity to innovate in a virtual environment to influence virtual team performance.

8.4 Limitations and Future Research

Factors that affect global virtual teams' performance are investigated in this study. Factors considered include trust, knowledge sharing, cultural difference, time zone difference, language difference, and distance. Applying the current findings to other virtual team members is not appropriate because which respondents are representative of virtual team members in other organizations is unknown. For instance, the respondents who represent team members in domestic teams may not have the same characteristics of more globally distributed teams. Virtual team research should start finding the impacts of individual member attitudes, experiences at multiple organizational levels. Moreover, greater attention is needed for the cross-cultural differences and to predict their impact on team dynamics (Gelfand et al., 2007). Furthermore, a leader's roles may be more important to manage conflict and influence team performance and effectiveness in complex tasks (Earley and Ang, 2003).

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Another limitation of this study is that the data is not collected on the stage of development of the virtual teams. The role of the leader may differ in the early phases of team formation and in the early stages of collaboration (Cramton, 2001).

The other limitation is related to the fact that, the respondents belong to different industries and they have different team sizes. Further, some organizations are working remotely due to the COVID-19. After pandemic, they are planning to work face-to-face again. In this sense, the differences in the size of the organization, type of products developed, the member's country of origin are different. Furthermore, distance has been discussed in virtual teams; in this study, it was included in the survey, but its results did not show a significant influence on team effectiveness.

Future study may analyze leadership and conflict in various stages of virtual team formation. In addition to this, respondents' perceptions of team outcomes are examined but the effect of leadership roles on actual performance outcomes is not clear. Future research should address these issues to determine the leaders' impact on team performance. Moreover, future research should cover case studies with different sizes of companies (e.g., small and medium enterprises) and various types of activities (e.g., research and development, new product development). Such a study will provide practices or types of activities that virtual teams should carry out to achieve effectiveness and success in a virtual environment. Furthermore, future research could define the types of technologies used by teams according to the complexity of the task and task-technology fit in virtual teams. Also, virtual teams can be custom-designed to define how technical skills affect virtual team collaboration. Finally, it can be explored in future studies, how non-technical industries work in virtual team settings. It is possible that different industries and backgrounds may have different collaborative relationships.

8.5 Concluding Remarks/ Conclusion

Teams are important in almost every organization. The use of different teams allows consideration of expertise in multiple areas as team members have different knowledge, skills, and abilities (Kozlowski and Ilgen, 2006). Traditionally, team members are located in the same place. With technological developments in communication, virtual teams have been increased and organizations build teams across barriers of time and space (Orvis and Zaccaro, 2008). Virtual teams can be very complex structures integrating cultural diversity, economic and financial factors, and management processes. Additionally, the complexity of the team increases with geographic dispersion, few face-to-face meetings, and dependence on virtual communication. It is critical to begin identifying factors that contribute to team success for

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virtual teams (Wakefield et al., 2008). This research defines the coordination mechanisms in a virtual team environment. The study focused on coordination mechanisms which are language difference, time difference, trust, cultural difference, knowledge sharing, distance their impacts on virtual teams. Organizations need to define the impacts of coordination mechanisms for their project. They need to understand and review the effect of virtual issues. Team effectiveness was impacted by trust, knowledge sharing, time difference, and language difference. Cultural difference and distance had no impact on team effectiveness. Trust is the heart of communication and collaboration for virtual team effectiveness. According to the results, the trust had a high positive impact on team effectiveness. Because virtual teamwork required trust among team members to achieve common goals. And it was found that when people trusted each other they had a greater self-responsibility, they felt more connected thus, they could work more motivated.

Knowledge sharing is the other significant factor for team effectiveness. The results showed that knowledge sharing had a high positive impact on team effectiveness. Sharing knowledge helped build trust between the teams and team members. Because sharing knowledge means discussing and deciding the business plans and strategies, defining the goals, and working together for your organization. Therefore, to achieve the organizational goal it was very important to share information in an appropriate way.

Team effectiveness was impacted by the time difference. The time difference was found challenging for virtual teams. All team members should be available at convenient hours while working across multiple time zones thus, it was significant to manage the time zone differences when scheduling the meetings. If the time scheduling is solved as early as possible it is easier to solve the specific requirements of the project which increases the team productivity.

Team effectiveness was impacted by language differences. Language difference was found very challenging for virtual teams. This is the most common problem because in many projects, collaborators speak English as a second language. This caused problems during the audio/video conferences because of the differences in dialects and accents. Also, nonnative speakers did not feel comfortable while speaking. In addition to these problems, misunderstandings could occur even all teams are fluent in a language. However, these issues could be solved and positively linked to team productivity, team effectiveness, and collaboration.

The effectiveness of standards was impacted by language differences and trust. It was challenging to write project documentation such as reports by different team members across different places by a non-native language. That's why language differences had a moderately negative impact on the project planning and documentation. In relation to trust, when team

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members built the trust, it increased the confidence, coordination mechanisms, and the efficiency of the project development.

The effectiveness of plans was impacted by time differences and trust. Time difference had a moderately negative impact on the project development phase. Because when team members were in different geographical locations they could not reply quickly, or they have a different holiday period. Thus, team members sometimes were not on the same line when encountered problems with the project plans. On the other hand, the trust had a moderately positive impact on plans. In the beginning, until building trust, it was difficult but when the team members built trust with each other it was easier to finish the tasks on time.

The effectiveness of formal mutual coherence was impacted by language difference, trust, and time difference. Time difference had a moderately negative impact on coordination. Team members have to work very early mornings or have to join night meetings which are not very efficient for the whole project. Language difference had a moderately negative impact because sometimes it could be harder to understand each other even everyone speaks the same language. It is possible to have misunderstandings or confusion during the meetings which can affect the project efficiency. Trust had a moderately positive impact on coordination mechanisms. Once trust is established collaboration would be easier between the teams.

The effectiveness of informal mutual coherence is impacted by language differences and trust. Language difference had a moderately negative impact due to the lack of fluency of the working language. And trust had a moderately positive impact when it has been built between the team members. Team members should try to build trust at the beginning of the work to be more efficient in the future.

In conclusion, there are many different types of virtual teams available and each team needs its unique necessities. A set of principles are needed for a virtual team environment. These principles are defined as follows:

- It is very important to respect cultural diversity and personality.
- Building trust and sharing knowledge are significant for collaboration. Because they allow employees to perform their tasks in a better way.
- The team should be built with the right skills according to the needs of the project. In addition to that, the team should be engaged in a common purpose.
- Project objectives, roles, and responsibilities should be clearly defined. Also, a feedback mechanism should be set up.
- While scheduling the meetings and calls, the time zones should be taken into account.

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- Communication tools should be selected according to the project needs, complexity, and criticality of the work because good use of collaborative tools improves communication and team efficiency. The work process should be documented, and confidential documents should be kept within the team.

In summary, global virtual teams offer organizations a wider skill that can reduce time to the market and increase project success rates. But in spite of their advantages, virtual teams have many challenges than traditional teams. Thus, understanding the root causes of the failures, defining the challenges and the solutions increase the efficiency of teamwork and efficiency of global virtual teams.

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Appendix

Appendix

Appendix 1. Demographics and Descriptive Statistics

Demographics and Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Count	Percentage
Please indicate your gender.	417	1.59	.492	1	2	169 Male 248 Female	40.53% 59.47%
[34 and under] Please indicate your age.	417	.81	.392	0	1	338	81.06%
[35 - 50]	417	.15	.359	0	1	63	15.11%
[over 50]	417	.04	.203	0	1	18	4.32%
[Information technology] Please indicate the industry sector that you work.	417	.22	.414	0	1	91	21.82%
[Manufacturing, aerospace, transportation]	417	.07	.255	0	1	29	6.95%
[Finance, insurance, legal, accounting]	417	.07	.259	0	1	30	7.19%
[Consumer products]	417	.12	.331	0	1	52	12.47%
[Education]	417	.17	.372	0	1	69	16.55%
[Pharmaceuticals, medical devices, healthcare]	417	.08	.270	0	1	33	7.91%
[Construction, engineering]	417	.05	.214	0	1	20	4.80%
[Chemicals, agriculture]	417	.01	.085	0	1	3	0.72%
[Less than 50] Please indicate the size of your organization.	417	.32	.468	0	1	135	32.37%
[50 - 100]	417	.13	.336	0	1	54	12.95%
[100 - 500]	417	.18	.388	0	1	77	18.47%
[500 - 1000]	417	.07	.255	0	1	29	6.95%
[1000 - 5000]	417	.08	.278	0	1	35	8.39%
[5000 - 10000]	417	.07	.255	0	1	29	6.95%
[above 10000]	417	.11	.311	0	1	45	10.79%
[Germany] In which country are you personally located?	417	.25	.432	0	1	103	24.70%
[United Kingdom]	417	.26	.437	0	1	107	25.66%
[Switzerland]	417	.02	.129	0	1	7	1.68%
[Spain]	417	.02	.145	0	1	9	2.16%
[Sweden]	417	.01	.119	0	1	6	1.44%
[Belgium]	417	.01	.085	0	1	3	0.72%
[France]	417	.02	.129	0	1	7	1.68%
[Italy]	417	.01	.098	0	1	4	0.96%
[Netherlands]	417	.05	.209	0	1	19	4.56%
[Finland]	417	.01	.098	0	1	4	0.96%
[Turkey]	417	.03	.160	0	1	11	2.64%
[Denmark]	417	.00	.069	0	1	2	0.48%
[Austria]	417	.02	.153	0	1	10	2.40%
[Czech Republic]	417	.00	.049	0	1	1	0.24%
Are you working in a virtual team?	417	1.42	.494	1	2	243 Yes 174 No	58.27% 41.73%
[Less than 1 yr] Experience in a traditional team.	174	.30	.462	0	1	53	30.46%
[1 yr - 2 yrs]	174	.26	.439	0	1	45	25.86%
[3 yrs - 5 yrs]	174	.28	.451	0	1	49	28.16%
[6 yrs - 10 yrs]	174	.10	.305	0	1	18	10.34%

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[more than 10 yrs]	174	.03	.168	0	1	5	2.87%
[Less than 1 yr] Experience in a virtual team.	243	.48	.501	0	1	117	48.15%
[1 yr - 2 yrs]	243	.26	.437	0	1	62	25.51%
[3 yrs - 5 yrs]	243	.15	.356	0	1	36	14.81%
[6 yrs - 10 yrs]	243	.07	.256	0	1	17	7.00%
[more than 10 yrs]	243	.05	.217	0	1	12	4.94%
[Less than 5] How many members are there in your virtual team?	243	.32	.466	0	1	77	77 31.69%
[6 - 10]	243	.34	.475	0	1	83	83 34.16%
[11 - 15]	243	.13	.339	0	1	32	32 13.17%
[15 - 20]	243	.05	.217	0	1	12	12 4.94%
[more than 20]	243	.15	.360	0	1	37	15.23%
[Less than 6 months] Expected life term of the virtual team?	243	.24	.430	0	1	59	59 24.28%
[6 months - 1 yr]	243	.28	.450	0	1	68	27.98%
[2 yrs - 3 yrs]	243	.21	.411	0	1	52	21.40%
[4 yrs - 5 yrs]	243	.04	.199	0	1	10	4.12%
[Greater than 5 yrs]	243	.04	.199	0	1	10	4.12%
[Permanent]	243	.16	.364	0	1	38	15.64%
[0 % - 25 %] Time spent working virtually	243	.19	.396	0	1	47	19.34%
[25 % - 50 %]	243	.31	.463	0	1	75	30.86%
[50 % - 75 %]	243	.19	.393	0	1	46	18.93%
[75 % - 100 %]	243	.31	.463	0	1	75	30.86%
Do all members on the same time zone?	243	1.44	.497	1	2	137 Yes 106 No	56.38% 43.62%
You are in the same time zone. Do all members work at the same country?	137	1.10	.304	1	2	123 Yes 14 No	89.78% 10.22%
You are in the same time zone and working at the same country. [Virtual team members are speaking the same language and working at the same company]	123	.78	.416	0	1	96	78.05%
[Virtual team members are speaking the same language but NOT working at the same company]	123	.18	.385	0	1	22	17.89%
[Virtual team members are NOT speaking the same language and working at the same company]	123	.04	.198	0	1	5	4.07%
[Virtual team members are NOT speaking the same language and NOT working at the same company]	123	.00	.000	0	0	0	0.00%

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You are in the same time zone but NOT in the same country. [Virtual team members are speaking the same language and working at the same company]	14	.29	.469	0	1	4	28.57%
[Virtual team members are speaking the same language but NOT working at the same company]	14	.21	.426	0	1	3	21.43%
[Virtual team members are NOT speaking the same language and working at the same company]	14	.21	.426	0	1	3	21.43%
[Virtual team members are NOT speaking the same language and NOT working at the same company]	14	.29	.469	0	1	4	28.57%
You are NOT in the same time zone. [Virtual team members are speaking the same language and working at the same company]	106	.37	.485	0	1	39	36.79%
[Virtual team members are speaking the same language but NOT working at the same company]	106	.24	.427	0	1	25	23.58%
[Virtual team members are NOT speaking the same language and working at the same company]	106	.12	.330	0	1	13	12.26%
[Virtual team members are NOT speaking the same language and NOT working at the same company]	106	.27	.448	0	1	29	27.36%
[There is no cultural diversity within the team.] To what extent is the virtual team culturally diverse?	243	.16	.368	0	1	39	16.05%
[There is a small mix of cultural diversity within the team.]	243	.44	.498	0	1	108	44.44%
[There is a remarkable degree of cultural diversity within the team.]	243	.28	.452	0	1	69	28.40%
[The team is 100 % culturally diverse.]	243	.11	.315	0	1	27	11.11%
[Have no prior project work with any of the team members.] Do you know any of the virtual team member from previous project?	243	.38	.486	0	1	92	37.86%
[Have worked with small number of team members on a previous project.]	243	.30	.459	0	1	73	30.04%
[Have worked with some members on a previous project.]	243	.21	.411	0	1	52	21.40%

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[Have worked with all members on previous project.]	243	.11	.310	0	1	26	10.70%
[Project Leader/Coordinator] Role	243	.14	.343	0	1	33	13.58%
[Project Manager]	243	.11	.310	0	1	26	10.70%
[Team member]	243	.53	.500	0	1	128	52.67%
[Researcher]	243	.13	.334	0	1	31	12.76%
[Never] How often does your team meet in person?	243	.15	.360	0	1	37	15.23%
[Once a year]	243	.20	.402	0	1	49	20.16%
[Twice a year]	243	.17	.379	0	1	42	17.28%
[Three times or more a year]	243	.35	.479	0	1	86	35.39%
[Face-to-face meetings] Form of communication	243	.48	.501	0	1	116	47.74%
[Audio conference]	243	.10	.299	0	1	24	9.88%
[Video conference]	243	.23	.419	0	1	55	22.63%
[Group emails]	243	.07	.262	0	1	18	7.41%
[Social media tools]	243	.02	.156	0	1	6	2.47%
[Mobile phone or another mobile device]	243	.01	.091	0	1	2	0.82%
[Voice over IP tools (e.g., Skype)]	243	.04	.189	0	1	9	3.70%
[Online office suite (e.g., Google Docs)]	243	.02	.156	0	1	6	2.47%

Appendix 2. Respondents' Characteristics

Demographics of participants

		Frequency	Percentage
1	Age		
	34 and under	338	81.06%
	35 - 50	63	15.11%
	over 50	18	4.32%
2	Industry		
	Information technology	91	21.82%
	Manufacturing, aerospace, transportation	29	6.95%
	Finance, insurance, legal, accounting	30	7.19%
	Consumer products	52	12.47%
	Education	69	16.55%
	Pharmaceuticals, medical devices, healthcare	33	7.91%
	Construction, engineering	20	4.80%
	Chemicals, agriculture	3	0.72%
	Other ¹	90	21.58%
3	Nationality		
	Germany	103	24.70%
	United Kingdom	107	25.66%
	Switzerland	7	1.68%
	Spain	9	2.16%
	Sweden	6	1.44%
	Belgium	3	0.72%
	France	7	1.68%
	Italy	4	0.96%
	Netherlands	19	4.56%
	Finland	4	0.96%

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	Turkey	11	2.64%
	Denmark	2	0.48%
	Austria	10	2.40%
	Czech Republic	1	0.24%
	Other ²	124	29.74%
4	Qualification/Role		
	Project Leader/Coordinator	33	13.58%
	Project Manager	26	10.70%
	Team member	128	52.67%
	Researcher	31	12.76%
	Other ³	25	10.29%
5	Experience in a virtual team/yrs		
	Less than 1 yr	117	48.15%
	1 yr - 2 yrs	62	25.51%
	3 yrs - 5 yrs	36	14.81%
	6 yrs - 10 yrs	17	7.00%
	more than 10 yrs	12	4.94%
6	Size of the team		
	Less than 5	77	31.69%
	6 - 10	83	34.16%
	11 - 15	32	13.17%
	15 - 20	12	4.94%
	more than 20	37	15.23%
	Other ⁴	2	0.82%
7	Expected life term of the virtual team		
	Less than 6 months	59	24.28%
	6 months - 1 yr	68	27.98%
	2 yrs - 3 yrs	52	21.40%
	4 yrs - 5 yrs	10	4.12%
	Greater than 5 yrs	10	4.12%
	Permanent	38	15.64%
	Other ⁵	6	2.47%
8	Time spent working virtually		
	0 % - 25 %	47	19.34%
	25 % - 50 %	75	30.86%
	50 % - 75 %	46	18.93%
	75 % - 100 %	75	30.86%

Other¹: Energy, Psychology, Hospitality, Marketing, Tourism, Psychology, Health and Science, Environmental sciences, Public relations, Design, Human resources, Engineering and education consultant, Government services.

Other²: Israel, Poland, United States, Canada, Portugal, Russia, Australia, Taiwan, Mexico, Malaysia, Pakistan, India, China, United Arab Emirates, Ethiopia, Ireland, Latvia, Hungary, Japan, Pakistan, Thailand, Cyprus, Greece, Philippines, Saudi Arabia, Bulgaria, Romania, Norway, Indonesia, South Africa, Egypt.

Other³: Product Owner, Founder, Head of Operations, Project organizer, Admin, Business Development, Customer Success Manager, Engineer, Tester, System Integrator, Software Engineer, Solution Architect, Marketing Manager, Sales, Assistant, Analyst, Managing Director, Designer, Data research, Copywriting, UX Researcher, Client Manager, Product Manager.

Other⁴: University with 11.500 students, Governmental organization.

Other⁵: Mainly 1-2yrs, depends on the pandemic/Unknown due to pandemic, 1 year, Not decided yet, virtual because of pandemic.

Appendix 3. Mean, Standard Deviation and Cronbach's Alpha for Traditional Team Questions

Item Statistics – Traditional Team

	Mean	Std. Deviation	N
[Team members have a shared purpose.]	4.03	.924	174
[Team members have unique skills to do their jobs effectively.]	3.83	.956	174
[Team members set and meet the the goals of the project.]	3.90	.968	174
[Team members produce efficient results.]	3.75	.875	174

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[The mission and goals of the team are well aligned with the organization's mission.]	3.82	.962	174
[Team members understand one another's roles.]	3.73	1.010	174
[Overlapping tasks are not problem for team members.]	3.37	1.076	174
[Team members are effective listeners.]	3.43	.939	174
[Communication is transparent between team members.]	3.49	.984	174
[Team members trust each other.]	3.67	.976	174
[Team members show high levels of cooperation and mutual support to each other.]	3.71	.930	174
[Team members established supportive relationship with other teams.]	3.66	.909	174
[Team members take initiative to solve the problems without the team leader.]	3.43	1.022	174
[Team leader and team members give each other a constructive feedback.]	3.59	1.015	174
[Team members can resolve differences in ways of doing business.]	3.47	.904	174
[Team members work with a great deal of flexibility so changing can be adapted easily.]	3.57	.963	174
[Team members arrange their priorities to meet the needs of the project.]	3.73	.944	174
[Team members focus on big picture strategic issues of the project.]	3.62	.988	174
[Team members are continually working to improve the success factors and key performance indicators.]	3.63	.951	174
[Group meetings are very efficient and productive.]	3.49	1.058	174
[Team members are rewarded in the team.]	3.13	1.207	174
[Team members use different tools/techniques to keep their skills up-to-date.]	3.50	1.019	174
[Development opportunities are provided to team members.]	3.52	1.063	174

Traditional Team -Total Statistics

Appendix

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
[Team members have a shared purpose.]	79.05	174.766	.514	.493	.918
[Team members have unique skills to do their jobs effectively.] Agree)	79.25	174.710	.497	.471	.919
[Team members set and meet the the goals of the project.]	79.19	172.039	.599	.529	.917
[Team members produce efficient results.]	79.33	173.391	.609	.477	.917
[The mission and goals of the team are well aligned with the organization 's mission.]	79.27	172.464	.585	.522	.917
[Team members understand one another 's roles.]	79.36	171.803	.580	.533	.917
[Overlapping tasks are not problem for team members.]	79.72	175.845	.392	.373	.921
[Team members are effective listeners.]	79.66	172.528	.599	.533	.917
[Communication is transparent between team members.]	79.59	170.555	.648	.591	.916
[Team members trust each other.]	79.42	171.794	.604	.595	.917
[Team members show high levels of cooperation and mutual support to each other.]	79.37	171.704	.641	.626	.916
[Team members established supportive relationship with other teams.]	79.43	173.691	.570	.458	.917
[Team members take initiative to solve the problems without the team leader.]	79.66	172.341	.552	.495	.918
[Team leader and team members give each other a constructive feedback.]	79.50	171.812	.577	.488	.917
[Team members can resolve differences in ways of doing business.]	79.61	173.625	.577	.496	.917
[Team members work with a great deal of flexibility so changing can be adapted easily.]	79.51	174.413	.505	.441	.919
[Team members arrange their priorities to meet the needs of the project.]	79.36	172.173	.610	.483	.917
[Team members focus on big picture strategic issues of the project.]	79.47	173.406	.530	.437	.918
[Team members are continually working to improve the success factors and key performance indicators.]	79.45	171.139	.649	.523	.916
[Group meetings are very efficient and productive.]	79.59	173.572	.484	.341	.919

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[Team members are rewarded in the team.]	79.95	172.507	.449	.389	.920
[Team members use different tools/techniques to keep their skills up-to-date.]	79.59	171.851	.573	.553	.917
[Development opportunities are provided to team members.]	79.56	172.120	.536	.518	.918

Appendix 4. Mean, Standard Deviation and Cronbach's Alpha for Virtual Team Questions

	Mean	Std. Deviation	N
[Check your email every day and respond within 24/48 hours.]	3.99	1.218	243
[Check your voice mail every day and return within 24 hours.]	3.33	1.393	243
[Exchange documents using Google Drive.]	3.38	1.371	243
[Attend all mandatory meetings.]	3.98	1.192	243
[If you cannot join the meeting let other people know.]	4.22	1.116	243
[There are appropriate standards for electronic communication and tools across organizations.]	3.99	1.062	243
[People from all functional and geographical areas have equal access and are skilled in using electronic communication and technology.]	3.96	1.096	243
[Be on time for video conferences, audio conferences and other meetings.]	4.14	1.076	243
[Rotate time zones for meetings.]	3.49	1.207	243
[In video conferences or audio conferences, keep muted when not speaking.]	3.90	1.135	243
[Do not interrupt others during the meetings.]	3.97	1.105	243
[An agenda is sent out via email 24 hours in advance of every meeting and minutes are sent out via email 24 hours after the meeting.]	3.69	1.099	243
[Respect the agenda.]	3.84	1.064	243
[Keep the interests and goals of the team at the top of all decisions.]	3.91	1.058	243
[Balance the local interests of team members with the entire team.]	3.68	.968	243
[If you need support, first contact the team member who is responsible from the project.]	3.86	1.020	243
[Resolve differences in ways of doing business.]	3.79	1.032	243
[Use an established conflict management process.]	3.65	1.126	243
[Do not solve the problems by using email. Use the telephone and speak directly with the person, not with the team leader.]	3.53	1.247	243

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[Recognize that conflict is more difficult to solve in a virtual environment therefore do not let tensions build.]	3.85	1.035	243
[The output of the project/work which the team produces is...]	3.57	.965	243
[The quality of the work is...]	3.65	.930	243
[The effectiveness of the team's interactions is...]	3.47	.968	243
[The team's ability to meet the deadlines is...]	3.55	1.008	243
[The team's ability to meet the project budget is...]	3.63	.973	243
[The team's ability to meet the goals of the project is...]	3.71	.975	243
[Review/assess long document details except audio or video conference sessions.]	3.35	1.075	243
[Keep confidential documents within the team.]	3.97	1.054	243
[While working sequentially, give feedback on time.]	4.03	.989	243
[Review the team's and project progress weekly or bi-weekly via audio/video conference.]	3.83	1.014	243
[There are mechanisms for sharing knowledge across boundaries.]	3.80	.984	243
[Working in a virtual environment requires a specific skills.]	3.52	.985	243
[Creating a sense of ownership of the project/goals is important for virtual teams.]	3.88	.957	243
[Leaders have skills such as working across boundaries and using technology effectively.]	4.00	.945	243
[Managing conflict]	3.25	1.087	243
[Establishing trust and relationship]	3.35	1.205	243
[Having an effective communication]	3.43	1.167	243
[Time zones]	3.21	1.306	243
[Partners/members who do not participate meetings]	3.50	1.137	243
[Misunderstandings due to differences in culture, language, etc.]	3.31	1.189	243
[Meeting deadlines]	3.00	1.225	243
[Loss of productivity due to the IT problems]	3.23	1.186	243
[Presenting ideas during meetings]	2.85	1.235	243
[Adhering to agenda]	2.83	1.231	243
[Difficulty in leading teams remotely]	3.08	1.174	243
[Technical and/or cost issues]	2.98	1.233	243
[Difficulty managing team members' productivity]	3.25	1.131	243

Appendix

Virtual Team -Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
[Check your email every day and respond within 24/48 hours.]	165.37	804.624	.613	.738	.950
[Check your voice mail every day and return within 24 hours.]	166.03	806.511	.505	.469	.951
[Exchange documents using Google Drive.]	165.98	810.173	.466	.378	.951
[Attend all mandatory meetings.]	165.39	805.742	.610	.751	.950
[If you cannot join the meeting let other people know.]	165.14	807.281	.629	.799	.950
[There are appropriate standards for electronic communication and tools across organizations.]	165.37	812.425	.576	.641	.951
[People from all functional and geographical areas have equal access and are skilled in using electronic communication and technology.]	165.40	810.795	.584	.698	.951
[Be on time for video conferences, audio conferences and other meetings.]	165.22	808.064	.641	.735	.950
[Rotate time zones for meetings.]	165.88	807.051	.582	.527	.951
[In video conferences or audio conferences, keep muted when not speaking.]	165.46	809.704	.580	.499	.951
[Do not interrupt others during the meetings.]	165.40	807.703	.629	.644	.950
[An agenda is sent out via email 24 hours in advance of every meeting and minutes are sent out via email 24 hours after the meeting.]	165.67	808.311	.623	.658	.950
[Respect the agenda.]	165.52	809.854	.618	.626	.950
[Keep the interests and goals of the team at the top of all decisions.]	165.46	809.241	.633	.666	.950
[Balance the local interests of team members with the entire team.]	165.68	812.325	.637	.626	.950
[If you need support, first contact the team member who is responsible from the project.]	165.51	812.706	.596	.667	.951
[Resolve differences in ways of doing business.]	165.57	807.313	.683	.715	.950
[Use an established conflict management process.]	165.71	806.885	.630	.603	.950
[Do not solve the problems by using email. Use the telephone and speak directly with the person, not with the team leader.]	165.83	813.223	.473	.530	.951
[Recognize that conflict is more difficult to solve in a virtual environment therefore do not let tensions build.]	165.51	810.755	.621	.630	.950

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[The output of the project/work which the team produces is...]	165.79	814.786	.594	.701	.951
[The quality of the work is...]	165.71	816.875	.578	.724	.951
[The effectiveness of the team's interactions is...]	165.89	820.190	.493	.597	.951
[The team's ability to meet the deadlines is...]	165.81	818.080	.509	.722	.951
[The team's ability to meet the project budget is...]	165.74	815.360	.579	.639	.951
[The team's ability to meet the goals of the project is...]	165.65	816.220	.562	.709	.951
[Review/assess long document details except audio or video conference sessions.]	166.01	808.975	.627	.587	.950
[Keep confidential documents within the team.]	165.39	814.347	.548	.609	.951
[While working sequentially, give feedback on time.]	165.33	811.438	.639	.664	.950
[Review the team's and project progress weekly or bi-weekly via audio/video conference.]	165.53	811.523	.621	.614	.950
[There are mechanisms for sharing knowledge across boundaries.]	165.56	814.677	.584	.621	.951
[Working in a virtual environment requires a specific skill.]	165.84	816.912	.543	.508	.951
[Creating a sense of ownership of the project/goals is important for virtual teams.]	165.48	814.656	.602	.628	.951
[Leaders have skills such as working across boundaries and using technology effectively.]	165.36	815.877	.587	.597	.951
[Managing conflict]	166.11	816.620	.494	.582	.951
[Establishing trust and relationship]	166.01	817.235	.432	.629	.951
[Having an effective communication]	165.93	819.004	.420	.624	.952
[Time zones]	166.15	816.953	.399	.392	.952
[Partners/members who do not participate meetings]	165.86	817.448	.457	.504	.951
[Misunderstandings due to differences in culture, language, etc.]	166.05	818.560	.418	.521	.952
[Meeting deadlines]	166.37	822.531	.348	.654	.952
[Loss of productivity due to the IT problems]	166.14	818.796	.416	.540	.952
[Presenting ideas during meetings]	166.51	822.515	.344	.685	.952
[Adhering to agenda]	166.53	822.622	.344	.717	.952
[Difficulty in leading teams remotely]	166.28	821.460	.381	.713	.952
[Technical and/or cost issues]	166.39	815.205	.451	.621	.951
[Difficulty managing team members' productivity]	166.11	818.579	.442	.607	.951

Appendix 5. Correlation - Communication in Traditional Teams

Spearman's Rank Correlation Coefficient is used to define the strength between communication data in traditional teams. In this table Spearman's Rank Correlation Coefficient shows the relationships for communication in traditional teams.

			Correlations				
			[Team members are effective listeners.]	[Communication is transparent between team members.]	[Team members trust each other.]	[Team members show high levels of cooperation and mutual support to each other.]	[Team members established supportive relationship with other teams.]
Spearman's rho	[Team members are effective listeners.]	Correlation Coefficient	--				
		Sig. (2-tailed)	.				
		N	174				
	[Communication is transparent between team members.]	Correlation Coefficient	.606**	--			
		Sig. (2-tailed)	.000	.			
		N	174	174			
	[Team members trust each other.]	Correlation Coefficient	.439**	.526**	--		
		Sig. (2-tailed)	.000	.000	.		
		N	174	174	174		
	[Team members show high levels of cooperation and mutual support to each other.]	Correlation Coefficient	.436**	.489**	.649**	--	
		Sig. (2-tailed)	.000	.000	.000	.	
		N	174	174	174	174	
	[Team members established supportive relationship with other teams.]	Correlation Coefficient	.292**	.377**	.437**	.533**	--
		Sig. (2-tailed)	.000	.000	.000	.000	.
		N	174	174	174	174	174

** . Correlation is significant at the 0.01 level (2-tailed).

Appendix 6. Correlation - Decision Making and Problem Solving in Traditional Teams

The Spearman's Rank Correlation Coefficient is used to define the strength between decision making and problem solving data in traditional teams. In this table Spearman's Rank Correlation Coefficient shows the relationships for decision making and problem solving in traditional teams.

Correlations

			[Team members take initiative to solve the problems without the team leader.]	[Team leader and team members give each other a constructive feedback.]	[Team members can resolve differences in ways of doing business.]	[Team members work with a great deal of flexibility so changing can be adapted easily.]	[Team members arrange their priorities to meet the needs of the project.]	[Team members focus on big picture strategic issues of the project.]
Spearman's rho	[Team members take initiative to solve the problems without the team leader.]	Correlation Coefficient	--					
		Sig. (2-tailed)	.					
		N	174					
	[Team leader and team members give each other a constructive feedback.]	Correlation Coefficient	.412**	--				
		Sig. (2-tailed)	.000	.				
		N	174	174				
	[Team members can resolve differences in ways of doing business.]	Correlation Coefficient	.458**	.375**	--			
		Sig. (2-tailed)	.000	.000	.			
		N	174	174	174			
	[Team members work with a great deal of flexibility so changing can be adapted easily.]	Correlation Coefficient	.424**	.278**	.446**	--		
		Sig. (2-tailed)	.000	.000	.000	.		
		N	174	174	174	174		
	[Team members arrange their priorities to meet the needs of the project.]	Correlation Coefficient	.325**	.416**	.373**	.430**	--	
		Sig. (2-tailed)	.000	.000	.000	.000	.	
		N	174	174	174	174	174	
	[Team members focus on big picture strategic issues of the project.]	Correlation Coefficient	.239**	.487**	.328**	.379**	.460**	--
		Sig. (2-tailed)	.001	.000	.000	.000	.000	.
		N	174	174	174	174	174	174

** . Correlation is significant at the 0.01 level (2-tailed).

Appendix 7. Correlation - Performance in Traditional Teams

The Spearman's Rank Correlation Coefficient is used to define the strength between performance data in traditional teams. In this table Spearman's Rank Correlation Coefficient shows the relationships for performance in traditional teams.

		Correlations					
		[Team members are continually working to improve the success factors and key performance indicators.]	[Group meetings are very efficient and productive.]	[Team members are rewarded in the team.]	[Team members use different tools/techniques to keep their skills up-to-date.]	[Development opportunities are provided to team members.]	
Spearman's rho	[Team members are continually working to improve the success factors and key performance indicators.]	Correlation Coefficient	--				
		Sig. (2-tailed)	.				
		N	174				
	[Group meetings are very efficient and productive.]	Correlation Coefficient	.360**	--			
		Sig. (2-tailed)	.000	.			
		N	174	174			
	[Team members are rewarded in the team.]	Correlation Coefficient	.357**	.428**	--		
		Sig. (2-tailed)	.000	.000	.		
		N	174	174	174		
	[Team members use different tools/techniques to keep their skills up to date.]	Correlation Coefficient	.464**	.361**	.433**	--	
		Sig. (2-tailed)	.000	.000	.000	.	
		N	174	174	174	174	
[Development opportunities are provided to team members.]	Correlation Coefficient	.424**	.346**	.427**	.564**	--	
	Sig. (2-tailed)	.000	.000	.000	.000	.	
	N	174	174	174	174	174	

** . Correlation is significant at the 0.01 level (2-tailed).

Appendix 8. Correlation - Purpose, Goals and Roles in Traditional Teams

The Spearman's Rank Correlation Coefficient is used to define the strength between purpose, goals and roles data in traditional teams. In this table Spearman's Rank Correlation Coefficient shows the relationships for purpose, goals and roles in traditional teams.

Appendix

Correlations

			[Team members have a shared purpose.]	[Team members have unique skills to do their jobs effectively.]	[Team members set and meet the goals of the project.]	[Team members produce efficient results.]	[The mission and goals of the team are well aligned with the organization's mission.]	[Team members understand one another's roles.]	[Overlapping tasks are not problem for team members.]
Spearman's rho	[Team members have a shared purpose.]	Correlation Coefficient	--						
		Sig. (2-tailed)	.						
		N	174						
	[Team members have unique skills to do their jobs effectively.]	Correlation Coefficient	.477**	--					
		Sig. (2-tailed)	.000	.					
		N	174	174					
	[Team members set and meet the the goals of the project.]	Correlation Coefficient	.461**	.489**	--				
		Sig. (2-tailed)	.000	.000	.				
		N	174	174	174				
	[Team members produce efficient results.]	Correlation Coefficient	.394**	.324**	.466**	--			
		Sig. (2-tailed)	.000	.000	.000	.			
		N	174	174	174	174			
	[The mission and goals of the team are well aligned with the organization's mission.]	Correlation Coefficient	.460**	.305**	.461**	.501**	--		
		Sig. (2-tailed)	.000	.000	.000	.000	.		
		N	174	174	174	174	174		
	[Team members understand one another's roles.]	Correlation Coefficient	.440**	.261**	.379**	.377**	.496**	--	
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.	
		N	174	174	174	174	174	174	
	[Overlapping tasks are not problem for team members.]	Correlation Coefficient	.311**	.243**	.208**	.321**	.317**	.508**	--
		Sig. (2-tailed)	.000	.001	.006	.000	.000	.000	.
		N	174	174	174	174	174	174	174

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** . Correlation is significant at the 0.01 level (2-tailed).

Appendix 9. Correlation - Challenges in Virtual Teams

The Spearman's Rank Correlation Coefficient is used to define the strength between challenges data in virtual teams. In this table Spearman's Rank Correlation Coefficient shows the relationships for challenges in virtual teams.

			Correlations												
			[Manag ing conflict]	[Esa blish ing trust and relati onshi p]	[Hav ing an effec tive com muni catio n]	[Tim e zone s]	[Part ners/ mem bers who do not parti cipate meet ings]	[Mis unde rstan dings due to diffe rence s in cultu re, lang uage, etc.]	[Mee ting deadl ines]	[Los s of prod uctiv ity due to the IT probl ems]	[Pres entin g ideas durin g meet ings]	[Adh ering to agen da]	[Diff icult y in leadi ng team s remo tely]	[Tec hnica l and/ or cost issue s]	[Diff icult y mana ging team mem bers' prod uctiv ity]
Spear man's rho	[Manag ing conflict]	Correlati on Coefficie nt	--												
		Sig. (2- tailed)	.												
		N	243												
[Esa blish ing trust and relati onshi p]	Correlati on Coefficie nt	.577**	--												
		Sig. (2- tailed)	.000	.											
		N	243	243											
[Havin g an effectiv e commu nicatio n]	Correlati on Coefficie nt	.515**	.648*	--											
		Sig. (2- tailed)	.000	.000	.										
		N	243	243	243										

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	N	243	243	243															
[Time zones]	Correlation Coefficient	.291**	.311*	.327*	--														
	Sig. (2-tailed)	.000	.000	.000	.														
	N	243	243	243	243														
[Partners/members who do not participate meetings]	Correlation Coefficient	.343**	.290*	.276*	.388*	--													
	Sig. (2-tailed)	.000	.000	.000	.000	.													
	N	243	243	243	243	243													
[Misunderstandings due to differences in culture, language, etc.]	Correlation Coefficient	.465**	.418*	.319*	.363*	.478*	--												
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.												
	N	243	243	243	243	243	243												
[Meeting deadlines]	Correlation Coefficient	.398**	.521*	.503*	.282*	.313*	.365*	--											
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.											
	N	243	243	243	243	243	243	243											
[Loss of productivity due to the IT problems]	Correlation Coefficient	.271**	.238*	.370*	.269*	.327*	.379*	.432*	--										
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.										

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	N	243	243	243	243	243	243	243	243					
[Presenting ideas during meetings]	Correlation Coefficient	.353**	.470*	.496*	.296*	.193*	.356*	.606*	.424*	--				
	Sig. (2-tailed)	.000	.000	.000	.000	.002	.000	.000	.000	.				
	N	243	243	243	243	243	243	243	243	243				
[Adhering to agenda]	Correlation Coefficient	.330**	.414*	.407*	.269*	.275*	.382*	.618*	.433*	.726*	--			
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.			
	N	243	243	243	243	243	243	243	243	243	243			
[Difficulty in leading teams remotely]	Correlation Coefficient	.500**	.573*	.555*	.244*	.378*	.413*	.519*	.341*	.579*	.612*	--		
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.		
	N	243	243	243	243	243	243	243	243	243	243	243		
[Technical and/or cost issues]	Correlation Coefficient	.349**	.389*	.410*	.385*	.388*	.426*	.522*	.571*	.504*	.538*	.482*	--	
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.	
	N	243	243	243	243	243	243	243	243	243	243	243	243	
[Difficulty managing team members?]	Correlation Coefficient	.367**	.460*	.506*	.329*	.435*	.415*	.472*	.456*	.475*	.478*	.507*	.540*	--
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.

Appendix

product N ivity]	243	243	243	243	243	243	243	243	243	243	243	243	243
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** . Correlation is significant at the 0.01 level (2-tailed).

Appendix 10. Correlation - Communication in Virtual Teams

The Spearman's Rank Correlation Coefficient is used to define the strength between communication data in virtual teams. In this table Spearman's Rank Correlation Coefficient shows the relationships for communication in virtual teams.

			Correlations							
			[Check your email every day and respond within 24/48 hours.]	[Check your voice mail every day and return within 24 hours.]	[Exchange documents using Google Drive.]	[Attend all mandatory meetings.]	[If you cannot join the meeting let other people know.]	[There are appropriate standards for electronic communication and tools across organizations.]	[People from all functional and geographical areas have equal access and are skilled in using electronic communication and technology.]	
Spearman's rho	[Check your email every day and respond within 24/48 hours.]	Correlation Coefficient	--							
		Sig. (2-tailed)	.000							
		N	243							
	[Check your voice mail every day and return within 24 hours.]	Correlation Coefficient	.513**	--						
		Sig. (2-tailed)	.000	.000						
		N	243	243						
	[Exchange documents using Google Drive.]	Correlation Coefficient	.361**	.378**	--					
		Sig. (2-tailed)	.000	.000	.000					
		N	243	243	243					
	[Attend all mandatory meetings.]	Correlation Coefficient	.592**	.372**	.376**	--				
		Sig. (2-tailed)	.000	.000	.000	.000				
		N	243	243	243	243				
	[If you cannot join the meeting	Correlation Coefficient	.635**	.420**	.284**	.689**	--			
		Sig. (2-tailed)	.000	.000	.000	.000	.000			

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let other people know.]	N	243	243	243	243	243		
[There are appropriate standards for electronic communication and tools across organizations.]	Correlation Coefficient	.441**	.385**	.217**	.516**	.630**	--	
	Sig. (2-tailed)	.000	.000	.001	.000	.000	.	
	N	243	243	243	243	243	243	
[People from all functional and geographical areas have equal access and are skilled in using electronic communication and technology.]	Correlation Coefficient	.504**	.322**	.285**	.606**	.643**	.660**	--
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.
	N	243	243	243	243	243	243	243

** . Correlation is significant at the 0.01 level (2-tailed).

Appendix 11. Correlation - Decision Making and Problem Solving in Virtual Teams

The Spearman's Rank Correlation Coefficient is used to define the strength between decision making and problem solving data in virtual teams. In this table Spearman's Rank Correlation Coefficient shows the relationships for decision making and problem solving in virtual teams.

		Correlations						
		[Keep the interests and goals of the team at the top of all decisions.]	[Balance the local interests of team members with the entire team.]	[If you need support, first contact the team member who is responsible from the project.]	[Resolve differences in ways of doing business.]	[Use an established conflict management process.]	[Do not solve the problems by using email. Use the telephone and speak directly with the person, not with the team leader.]	[Recognize that conflicts are more difficult to solve in a virtual environment therefore do not let tensions build.]
Spearman's rho	[Keep the interests and goals of the team at the top of all decisions.]	Correlation Coefficient	--					
		Sig. (2-tailed)	.					
		N	243					
[Balance the local interests of team members with the entire team.]	[Balance the local interests of team members with the entire team.]	Correlation Coefficient	.529**	--				
		Sig. (2-tailed)	.000	.				
		N	243	243				

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[If you need support, first contact the team member who is responsible from the project.]	Correlation Coefficient	.509**	.551**	--				
	Sig. (2-tailed)	.000	.000	.				
	N	243	243	243				
[Resolve differences in ways of doing business.]	Correlation Coefficient	.548**	.568**	.605**	--			
	Sig. (2-tailed)	.000	.000	.000	.			
	N	243	243	243	243			
[Use an established conflict management process.]	Correlation Coefficient	.484**	.451**	.460**	.569**	--		
	Sig. (2-tailed)	.000	.000	.000	.000	.		
	N	243	243	243	243	243		
[Do not solve the problems by using email. Use the telephone and speak directly with the person, not with the team leader.]	Correlation Coefficient	.281**	.333**	.263**	.288**	.268**	--	
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.	
	N	243	243	243	243	243	243	
[Recognize that conflict is more difficult to solve in a virtual environment therefore do not let tensions build.]	Correlation Coefficient	.500**	.416**	.353**	.523**	.409**	.517**	--
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.
	N	243	243	243	243	243	243	243

** . Correlation is significant at the 0.01 level (2-tailed).

Appendix 12. Correlation - Meeting Management in Virtual Teams

The Spearman's Rank Correlation Coefficient is used to define the strength between meeting management data in virtual teams. In this table Spearman's Rank Correlation Coefficient shows the relationships for meeting management in virtual teams.

Correlations

Appendix

			[Be on time for video conferences, audio conferences and other meetings.]	[Rotate time zones for meetings.]	[In video conferences or audio conferences, keep muted when not speaking.]	[Do not interrupt others during the meetings.]	[An agenda is sent out via email 24 hours in advance of every meeting and minutes are sent out via email 24 hours after the meeting.]	[Respect the agenda.]
Spearman's rho	[Be on time for video conferences, audio conferences and other meetings.]	Correlation Coefficient	--					
		Sig. (2-tailed)	.					
		N	243					
	[Rotate time zones for meetings.]	Correlation Coefficient	.370**	--				
		Sig. (2-tailed)	.000	.				
		N	243	243				
	[In video conferences or audio conferences, keep muted when not speaking.]	Correlation Coefficient	.510**	.305**	--			
		Sig. (2-tailed)	.000	.000	.			
		N	243	243	243			
	[Do not interrupt others during the meetings.]	Correlation Coefficient	.515**	.413**	.525**	--		
		Sig. (2-tailed)	.000	.000	.000	.		
		N	243	243	243	243		
	[An agenda is sent out via email 24 hours in advance of every meeting and minutes are sent out via email 24 hours after the meeting.]	Correlation Coefficient	.450**	.478**	.356**	.430**	--	
		Sig. (2-tailed)	.000	.000	.000	.000	.	
		N	243	243	243	243	243	
	[Respect the agenda.]	Correlation Coefficient	.510**	.385**	.404**	.463**	.627**	--
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.
		N	243	243	243	243	243	243

** . Correlation is significant at the 0.01 level (2-tailed).

Appendix 13. Correlation - Performance in Virtual Teams

The Spearman's Rank Correlation Coefficient is used to define the strength between performance data in virtual teams. In this table Spearman's Rank Correlation Coefficient shows the relationships for performance in virtual teams.

			Correlations					
			[The output of the project/work which the team produces is...]	[The quality of the work is...]	[The effectiveness of the team's interactions is...]	[The team's ability to meet the deadlines is...]	[The team's ability to meet the project budget is...]	[The team's ability to meet the goals of the project is...]
Spearman's rho	[The output of the project/work which the team produces is...]	Correlation Coefficient	--					
		Sig. (2-tailed)	.					
		N	243					
	[The quality of the work is...]	Correlation Coefficient	.665**	--				
		Sig. (2-tailed)	.000	.				
		N	243	243				
	[The effectiveness of the team's interactions is...]	Correlation Coefficient	.564**	.583**	--			
		Sig. (2-tailed)	.000	.000	.			
		N	243	243	243			
	[The team's ability to meet the deadlines is...]	Correlation Coefficient	.599**	.494**	.609**	--		
		Sig. (2-tailed)	.000	.000	.000	.		
		N	243	243	243	243		
	[The team's ability to meet the project budget is...]	Correlation Coefficient	.528**	.505**	.512**	.646**	--	
		Sig. (2-tailed)	.000	.000	.000	.000	.	
		N	243	243	243	243	243	
	[The team's ability to meet the goals of the project is...]	Correlation Coefficient	.620**	.660**	.571**	.651**	.615**	--
		Sig. (2-tailed)	.000	.000	.000	.000	.000	.
		N	243	243	243	243	243	243

** . Correlation is significant at the 0.01 level (2-tailed).

Appendix 14. Correlation - Working Together to Review Documents in Virtual Teams

The Spearman's Rank Correlation Coefficient is used to define the strength between working together to review documents data in virtual teams. In this table Spearman's Rank Correlation Coefficient shows the relationships for working together to review documents in virtual teams.

			Correlations							
			[Review/assess long document details except audio or video conference sessions.]	[Keep confidential documents within the team.]	[While working sequentially, give feedback on time.] Please assess working together to review documents in virtual environments (1: Not at all important; 2: Slightly Important; 3: Important; 4: Fairly Important; 5: Very Important)	[Review the team's and project progress weekly or bi-weekly via audio/video conference.]	[There are mechanisms for sharing knowledge across boundaries.]	[Working in a virtual environment requires a specific skill.]	[Creating a sense of ownership of the project/goals is important for virtual teams.]	[Leaders have skills such as working across boundaries and using technology effectively.]
Spearman's rho	[Review/assess long document details except audio or video conference sessions.]	Correlation Coefficient	--							
		Sig. (2-tailed)	.							
		N	243							
Spearman's rho	[Keep confidential documents]	Correlation Coefficient	.383**	--						
		Sig. (2-tailed)	.000	.						

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within the team.]	N	243	243						
[While working sequentially, give feedback on time.]	Correlation Coefficient	.452**	.537**	--					
	Sig. (2-tailed)	.000	.000	.					
	N	243	243	243					
[Review the team's and project progress weekly or bi-weekly via audio/video conference.]; 5: Very	Correlation Coefficient	.474**	.440**	.490**	--				
	Sig. (2-tailed)	.000	.000	.000	.				
	N	243	243	243	243				
[There are mechanisms for sharing knowledge across boundaries.]	Correlation Coefficient	.357**	.492**	.454**	.527**	--			
	Sig. (2-tailed)	.000	.000	.000	.000	.			
	N	243	243	243	243	243			
[Working in a virtual environment requires a specific skills.]	Correlation Coefficient	.418**	.365**	.382**	.329**	.384**	--		
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.		
	N	243	243	243	243	243	243		
[Creating a sense of ownership of the project/goals is important for virtual teams.]	Correlation Coefficient	.407**	.453**	.537**	.455**	.492**	.477**	--	
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.	
	N	243	243	243	243	243	243	243	
[Leaders have skills such as working across boundaries and using technology effectively.]	Correlation Coefficient	.398**	.537**	.545**	.519**	.571**	.437**	.595**	--
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.
	N	243	243	243	243	243	243	243	243

** . Correlation is significant at the 0.01 level (2-tailed).

Appendix 15. One-Sample Kolmogorov-Smirnov Normal Test (Traditional Teams)

Purpose, goals and roles according to the traditional teams

	Asymptotic Sig. (2-sided test)	N	Mean	Result
Team members have a shared purpose.	.000	183	4.0	Supported
Team members have unique skills to do their jobs effectively.	.000	183	3.8	Supported

Appendix

Team members set and meet the goals of the project.	.000	183	3.9	Supported
Team members produce efficient results.	.000	183	3.8	Supported
The mission and goals of the team are well aligned with the organization's mission.	.000	183	3.8	Supported
Team members understand one another's roles.	.000	183	3.7	Supported
Overlapping tasks are not problem for team members.	.000	183	3.4	Supported

Communication with other team members in traditional teams

	Asymptotic Sig. (2-sided test)	N	Mean	Result
Team members are effective listeners.	.000	179	3.4	Supported
Communication is transparent between team members.	.000	179	3.5	Supported
Team members trust each other.	.000	179	3.7	Supported
Team members show high levels of cooperation and mutual support to each other.	.000	179	3.7	Supported
Team members established supportive relationship with other teams.	.000	179	3.7	Supported

Decision making and problem solving according to the traditional teams

	Asymptotic Sig. (2-sided test)	N	Mean	Result
Team members take initiative to solve the problems without the team leader.	.000	176	3.4	Supported
Team leader and team members give each other a constructive feedback.	.000	176	3.6	Supported
Team members can resolve differences in ways of doing business.	.000	176	3.5	Supported
Team members work with a great deal of flexibility so changing can be adapted easily.	.000	176	3.6	Supported
Team members arrange their priorities to meet the needs of the project.	.000	176	3.7	Supported
Team members focus on big picture strategic issues of the project.	.000	176	3.6	Supported

Performance of traditional teams

	Asymptotic Sig. (2-sided test)	N	Mean	Result
Team members are continually working to improve the success factors and key performance indicators.	.000	174	3.6	Supported
Group meetings are very efficient and productive.	.000	174	3.5	Neutral

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Team members are rewarded in the team.	.000	174	3.1	Neutral
Team members use different tools/techniques to keep their skills up to date.	.000	174	3.5	Supported
Development opportunities are provided to team members.	.000	174	3.5	Supported

Appendix 16. One-Sample Kolmogorov-Smirnov Normal Test (Virtual Teams)

Critical Success Factors in Virtual Teams

	Asymptotic Sig. (2-sided test)	N	Frequency	Question Type
In virtual teams, cultural difference has a positive/negative impact on team effectiveness.	.000	243	38.68%	Moderately positive effect
In virtual teams, language difference has a positive/negative impact on team effectiveness.	.000	243	50.21%	Moderately negative effect
In virtual teams, distance has a positive/negative impact on team effectiveness.	.000	243	39.09%	No effect
In virtual teams, time difference has a positive/negative impact on team effectiveness.	.000	243	44.03%	Moderately negative effect
Meeting face-to-face has a positive/negative impact on communication and team effectiveness.	.000	243	42.80%	High positive effect
In virtual team environments, leadership has an impact on team effectiveness.	.000	243	41.56%	Moderately positive effect
In virtual teams, knowledge sharing among team members has a positive/negative impact on team effectiveness.	.000	243	47.33%	High positive effect
In virtual team environments, knowledge sharing has a positive/negative impact on trust among team members.	.000	243	46.09%	High positive effect
In virtual teams, effective leadership has a positive/negative impact on trust among team members.	.000	243	44.03%	High positive effect
Good access to technical training has a positive/negative impact on team effectiveness.	.000	243	41.15%	Moderately positive effect
The culture supports shared ways of doing business across teams and organisations thus, has a positive/negative impact on team effectiveness.	.000	243	45.27%	Moderately positive effect
High trust between organisations and team members has a positive/negative impact on team effectiveness.	.000	243	50.21%	High positive effect
Team members` experience in working across boundaries has a positive/negative impact on team effectiveness.	.000	243	42.39%	Moderately positive effect
The skills of the project manager/leader has a positive/negative impact on the performance of the virtual team.	.000	243	45.27%	High positive effect

Appendix

Communication with other team members in virtual environments

	Asymptotic Sig. (2-sided test)	N	Mean	Question Type	Result
Check your email every day and respond within 24/48 hours.	.000	245	4.0	Very important	Supported
Check your voice mail every day and return within 24 hours.	.000	245	3.3	Very important	Supported
Exchange documents using Google Drive.	.000	245	3.4	Very important	Supported
Attend all mandatory meetings.	.000	245	4.0	Very important	Supported
If you cannot join the meeting let other people know.	.000	245	4.2	Very important	Supported
There are appropriate standards for electronic communication and tools across organizations.	.000	245	4.0	Very important	Supported
People from all functional and geographical areas have equal access and are skilled in using electronic communication and technology.	.000	245	4.0	Very important	Supported

Meeting management in terms of virtual environments

	Asymptotic Sig. (2-sided test)	N	Mean	Question Type	Result
Be on time for video conferences, audio conferences and other meetings.	.000	245	4.1	Very important	Supported
Rotate time zones for meetings.	.000	245	3.5	Fairly important	Supported
In video conferences or audio conferences, keep muted when not speaking.	.000	245	3.9	Very important	Supported
Do not interrupt others during the meetings.	.000	245	4.0	Very important	Supported
An agenda is sent out via email 24 hours in advance of every meeting and minutes are sent out via email 24 hours after the meeting.	.000	245	3.7	Fairly important	Supported
Respect the agenda.	.000	245	3.8	Very important	Supported

Decision making and problem solving in terms of virtual environments

	Asymptotic Sig. (2-sided test)	N	Mean	Question Type	Result
Keep the interests and goals of the team at the top of all decisions.	.000	245	3.9	Fairly important	Supported
Balance the local interests of team members with the entire team.	.000	245	3.7	Fairly important	Supported

Appendix

If you need support, first contact the team member who is responsible from the project.	.000	245	3.9	Fairly important	Supported
Resolve differences in ways of doing business.	.000	245	3.8	Fairly important	Supported
Use an established conflict management process.	.000	245	3.7	Fairly important	Supported
Do not solve the problems by using email. Use the telephone and speak directly with the person, not with the team leader.	.000	245	3.5	Fairly important	Supported
Recognize that conflict is more difficult to solve in a virtual environment therefore do not let tensions build.	.000	245	3.8	Fairly important	Supported

Performance of the virtual teams

	Asymptotic Sig. (2-sided test)	N	Mean	Question Type	Result
The output of the project/work which the team produces is...	.000	245	3.6	Exceeds expectations	Supported
The quality of the work is...	.000	245	3.7	Meet expectations	Supported
The effectiveness of the team's interactions is...	.000	245	3.5	Meet expectations	Supported
The team's ability to meet the deadlines is...	.000	245	3.6	Exceeds expectations	Supported
The team's ability to meet the project budget is...	.000	245	3.6	Exceeds expectations	Supported
The team's ability to meet the goals of the project is...	.000	245	3.7	Exceeds expectations	Supported

Working together to review documents in virtual environments

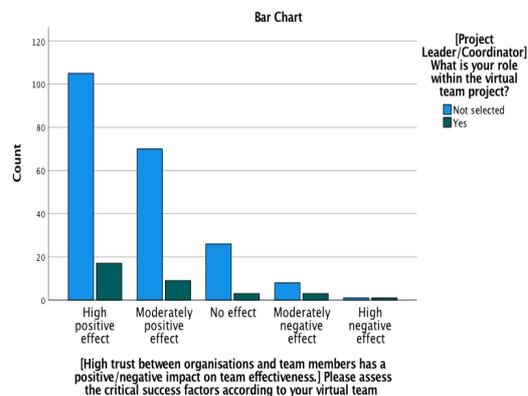
	Asymptotic Sig. (2-sided test)	N	Mean	Question Type	Result
Review/assess long document details except audio or video conference sessions.	.000	243	3.4	Important	Supported
Keep confidential documents within the team.	.000	243	4.0	Very important	Supported
While working sequentially, give feedback on time.	.000	243	4.0	Very important	Supported
Review the team's and project progress weekly or bi-weekly via audio/video conference.	.000	243	3.8	Fairly important	Supported
There are mechanisms for sharing knowledge across boundaries	.000	243	3.8	Fairly important	Supported
Working in a virtual environment requires a specific skill.	.000	243	3.5	Fairly important	Supported
Creating a sense of ownership of the project/goals is important for virtual teams.	.000	243	3.9	Fairly important	Supported
Leaders have skills such as working across boundaries and using technology effectively.	.000	243	4.0	Fairly important	Supported

Appendix

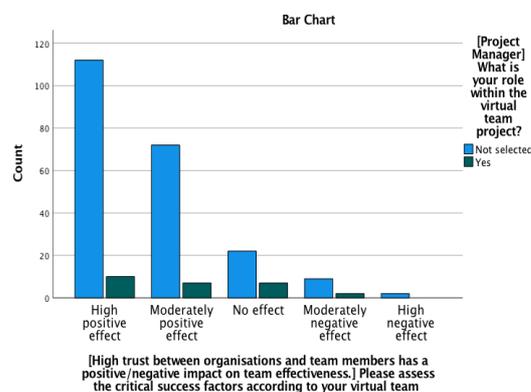
Challenges faced by virtual teams

	Asymptotic Sig. (2-sided test)	N	Mean	Question Type	Result
Managing conflict.	.000	243	3.3	Very challenging	Supported
Establishing trust and relationship.	.000	243	3.3	Challenging	Supported
Having an effective communication.	.000	243	3.4	Very challenging	Supported
Time zones.	.000	243	3.2	Challenging	Supported
Partners/members who do not participate meetings.	.000	243	3.5	Very challenging	Supported
Misunderstandings due to differences in culture, language, etc.	.000	243	3.3	Very challenging	Supported
Meeting deadlines.	.000	243	3.0	Challenging	Supported
Loss of productivity due to the IT problems.	.000	243	3.2	Challenging	Supported
Presenting ideas during meetings.	.000	243	2.8	Challenging	Supported
Adhering to agenda.	.000	243	2.8	Challenging	Supported
Difficulty in leading teams remotely.	.000	243	3.1	Challenging	Supported
Technical and/or cost issues.	.000	243	3.0	Challenging	Supported
Difficulty managing team members' productivity.	.000	243	3.3	Challenging	Supported

Appendix 17. Hypothesis 1 and Role Comparison

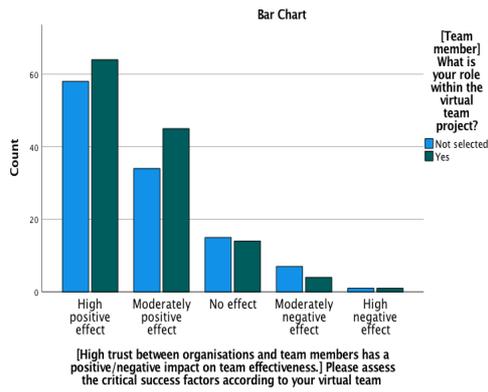


Project Leader/Coordinator

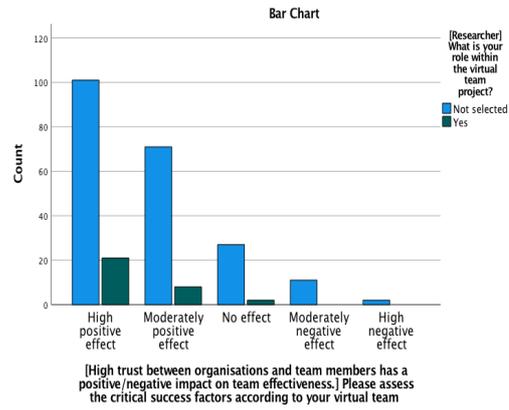


Project Manager

Appendix



Team Member

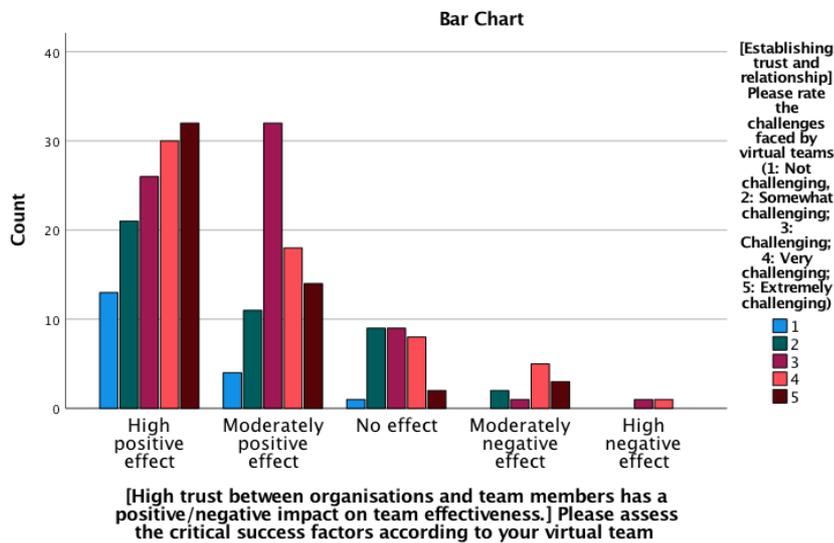


Researcher

Appendix 18. Comparing the Challenges with Hypothesis 1:

Establishing trust and relationship

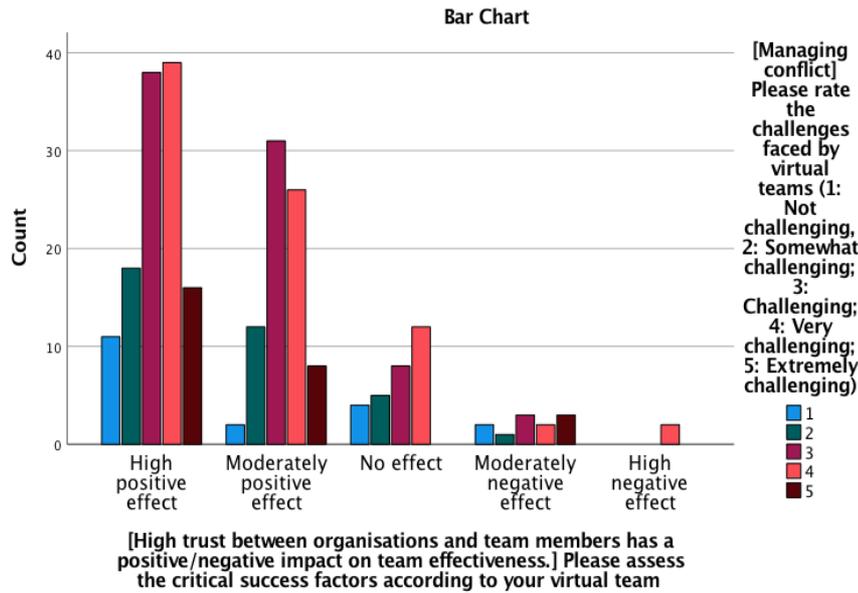
To compare the relation between trust and establishing trust and relationship Chi-square test was conducted. There was no significant difference between trust and establishing trust and relationship, $X^2(16, N = 243) = 23.777, p = .094$, suggesting that establishing trust and relationship can impact virtual team effectiveness positively since it was found extremely challenging (62.7%).



Establishing trust and relationship comparison

Managing Conflict

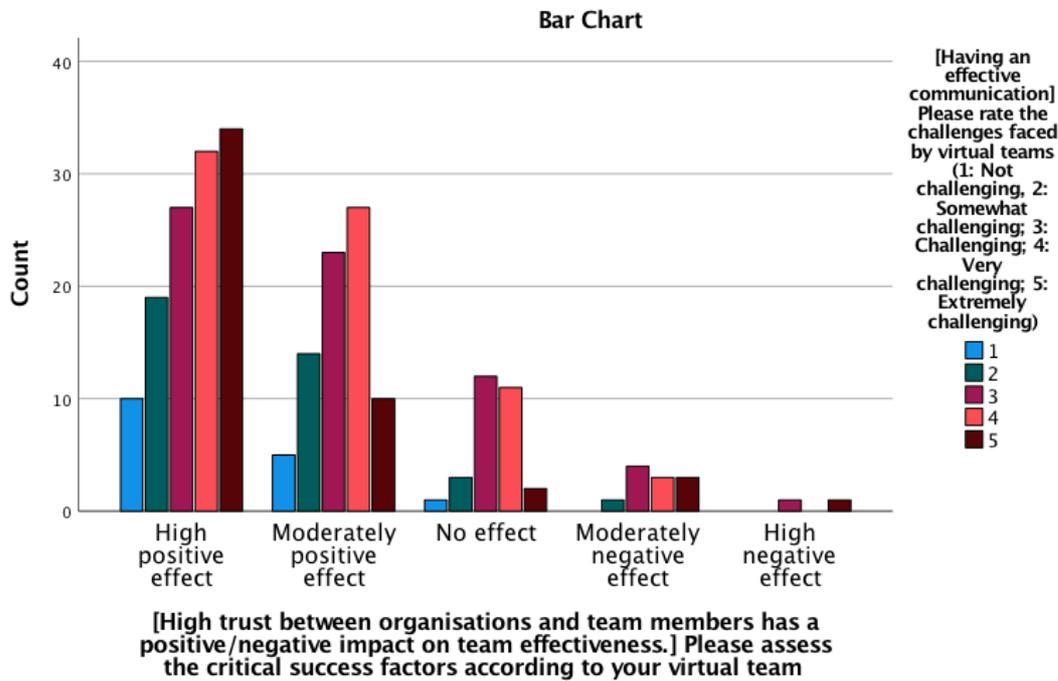
To compare the relation between trust and managing conflict, Chi-square test was conducted. There was no significant difference between trust and managing conflict, $X^2(16, N = 243) = 19.392, p = .249$, and managing conflict was found very challenging (48.1%).



Relation between trust and managing conflict

Having an Effective Communication

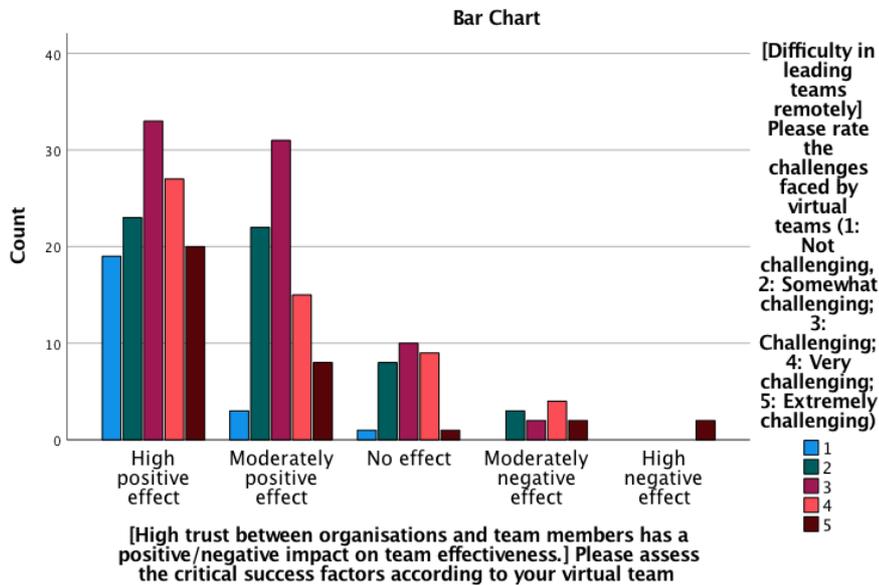
To compare the relation between trust and effective communication Chi-square test was conducted. There was no significant difference between trust and effective communication, $X^2(16, N = 243) = 18.747, p = .282$, and effective communication was found extremely challenging (68.0%).



Relation between trust and effective communication

Difficulty in Leading Teams Remotely

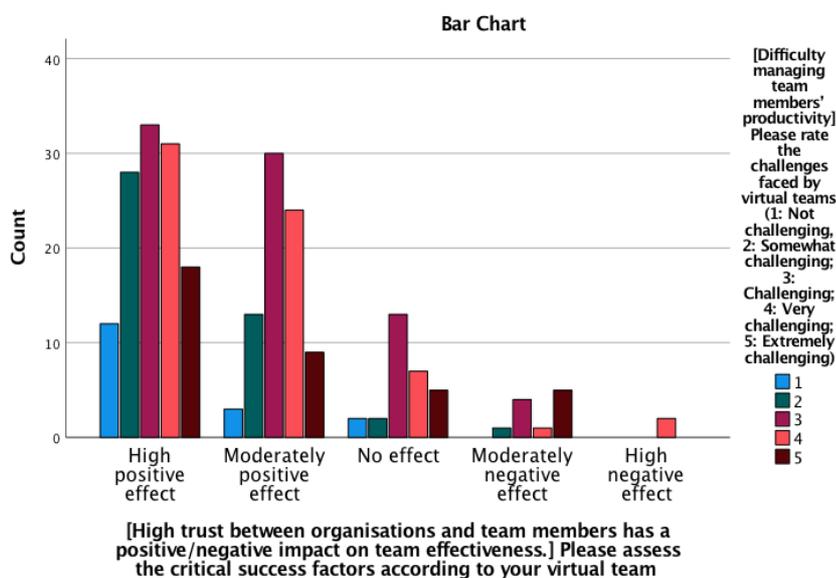
To compare the relation between trust and leading teams remotely, Chi-square test was conducted. There was a significant difference between trust and leading teams remotely, $X^2(16, N = 243) = 33.499, p = .006$, and leading teams remotely was found challenging (43.4%)



Relation between trust and leading teams remotely

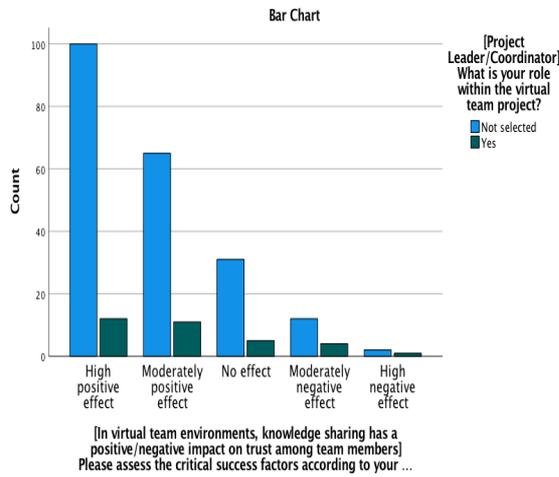
Difficulty Managing Team Members' Productivity

To compare the relation between trust and difficulty managing team members' productivity, Chi-square test was conducted. There was no significant difference between trust and difficulty managing team members' productivity, $X^2(16, N = 243) = 25.480, p = .062$, and managing team members' productivity was found challenging (41.3%).

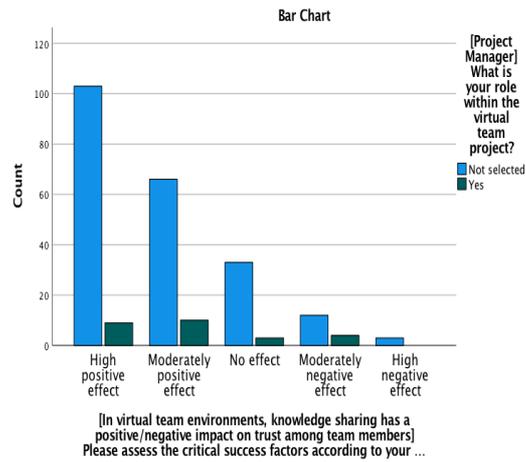


Relation between trust and difficulty managing team members' productivity

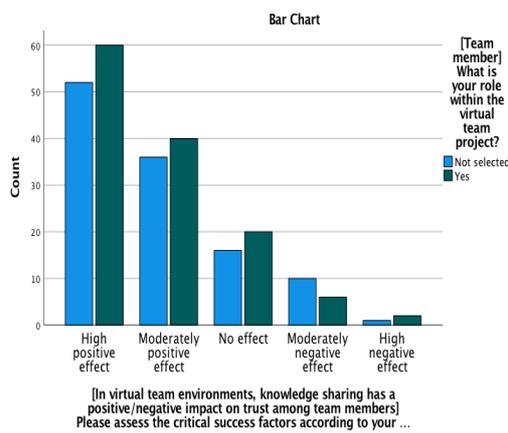
Appendix 19. Hypothesis 2 and Role Comparison



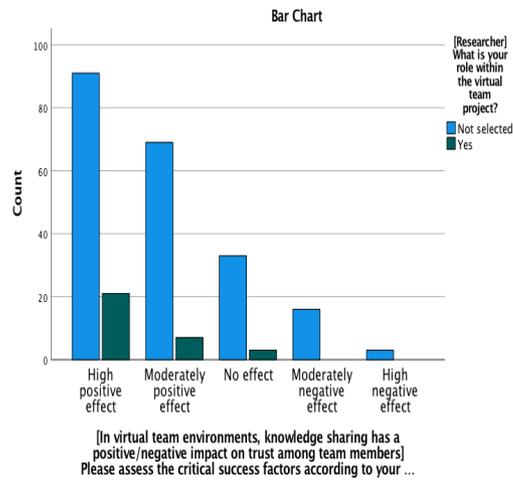
Project Leader/Coordinator



Project Manager



Team Member

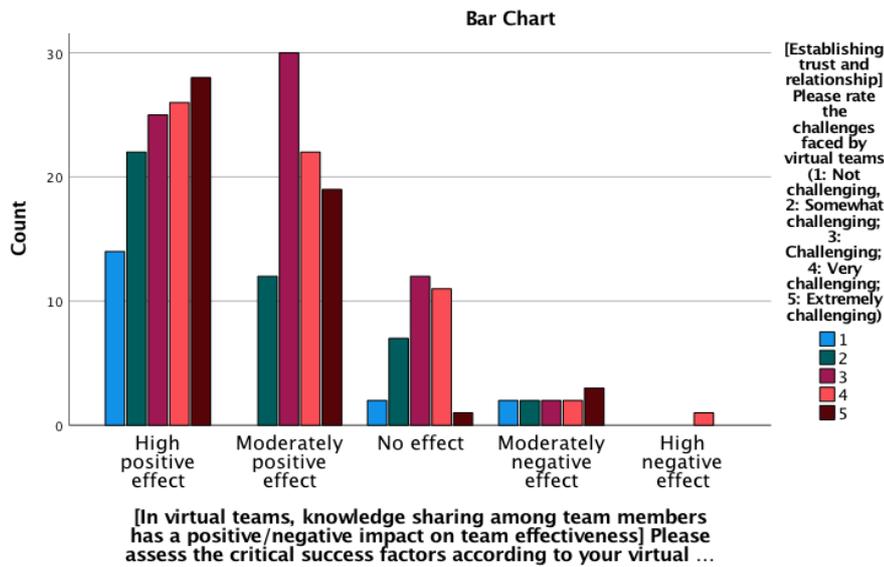


Researcher

Appendix 20. Comparing the Challenges with Hypothesis 2:

Establishing trust and relationship

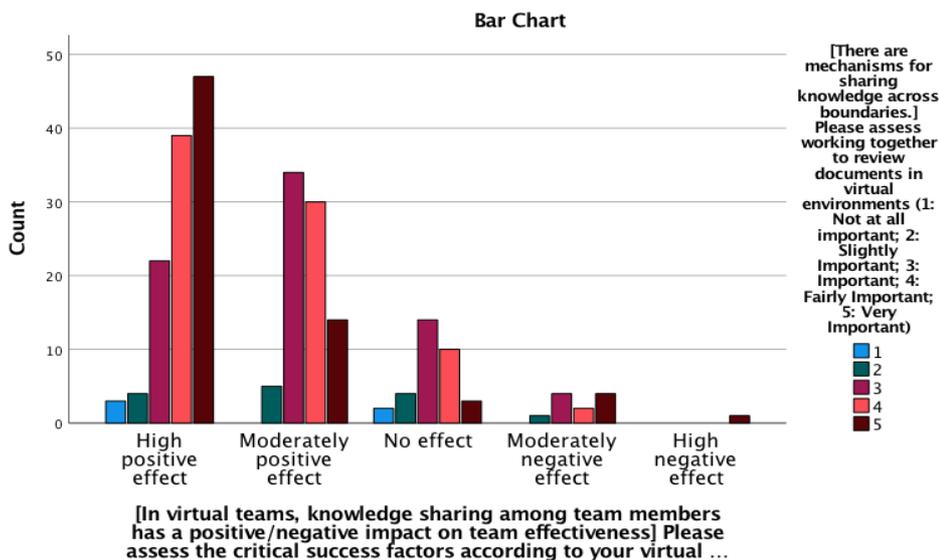
To compare the relation between knowledge sharing and establishing trust and relationship Chi-square test was conducted. There was a significant difference between knowledge sharing and establishing trust and relationship, $X^2(16, N = 243) = 27.423, p = .037$, suggesting that knowledge sharing has a positive impact on establishing trust and relationship and it was found extremely challenging (54.9%).



Relation between knowledge sharing and establishing trust and relationship

There are mechanisms for sharing knowledge across boundaries

To compare the relation between knowledge sharing and the mechanisms for sharing knowledge across boundaries, Chi-square test was conducted. There was a significant difference between knowledge sharing and the mechanisms for sharing knowledge across boundaries, $X^2(16, N = 243) = 36.126, p = .003$, suggesting that knowledge sharing should be considered in virtual environments since it was found extremely challenging (68.1%).



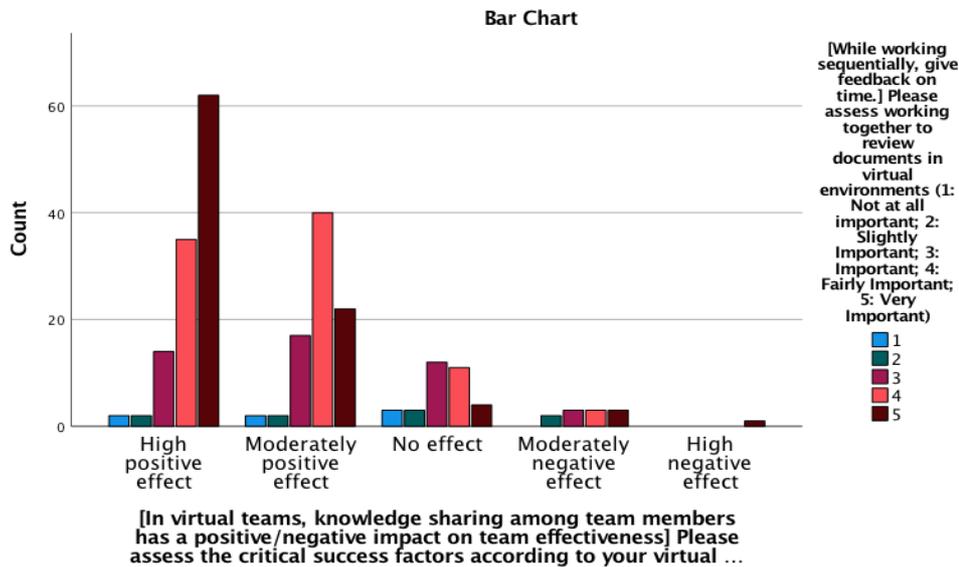
Relation between knowledge sharing and the mechanisms for sharing knowledge

While working sequentially give feedback on time

To compare the relation between knowledge sharing and giving feedback on time, Chi-square test was conducted. The relation between knowledge sharing and giving feedback was

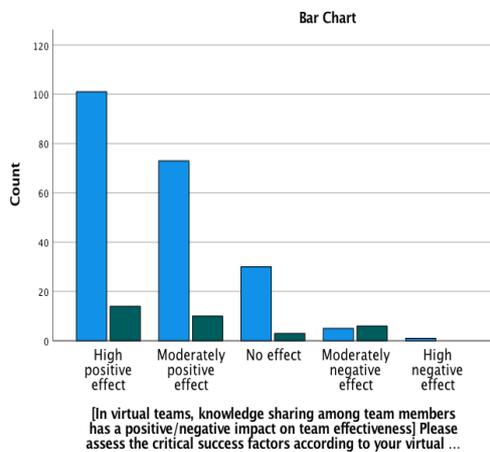
Appendix

significant, $X^2(16, N = 243) = 47.277, p = .000$, giving feedback on time was extremely challenging (67.4%).

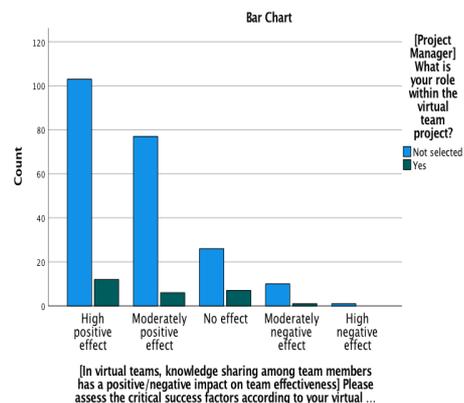


Relation between knowledge sharing and giving feedback

Appendix 21. Hypothesis 3 and Role Comparison

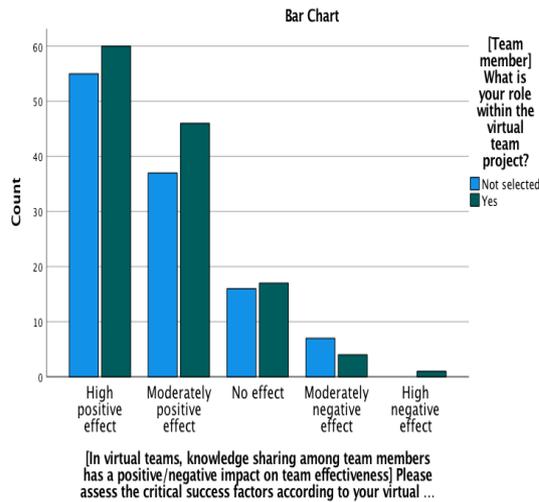


Project Leader/Coordinator

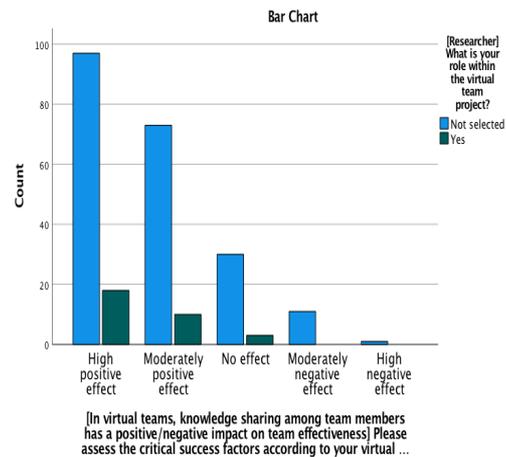


Project Manager

Appendix



Team Member

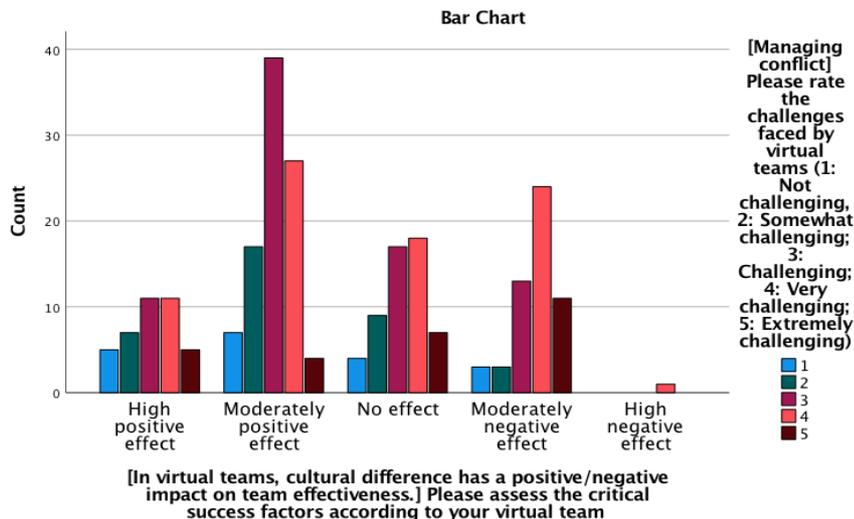


Researcher

Appendix 22. Comparing the Challenges with Hypothesis 4:

Managing conflict

To compare the relation between cultural difference and managing conflict, Chi-square test was conducted. According to the results, there was no significant difference between cultural difference and managing conflict, $X^2(16, N = 243) = 22.789, p = .119$, thus, cultural difference has positive impact on team effectiveness and managing conflict was found challenging (48.8%).



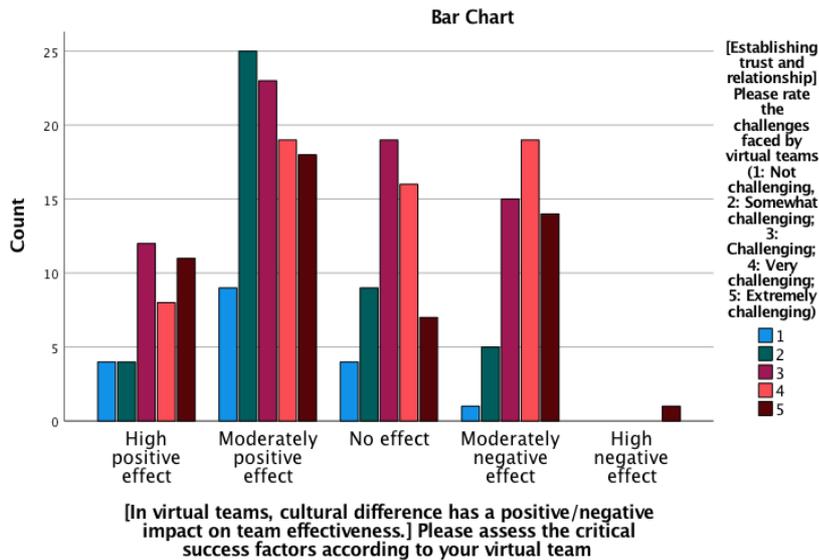
Relation between cultural difference and managing conflict

Establishing trust and relationship

To compare the relation between cultural difference and establishing trust and relationship, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and establishing trust and relationship, $X^2(16, N = 243) = 23.230, p = .108$, thus,

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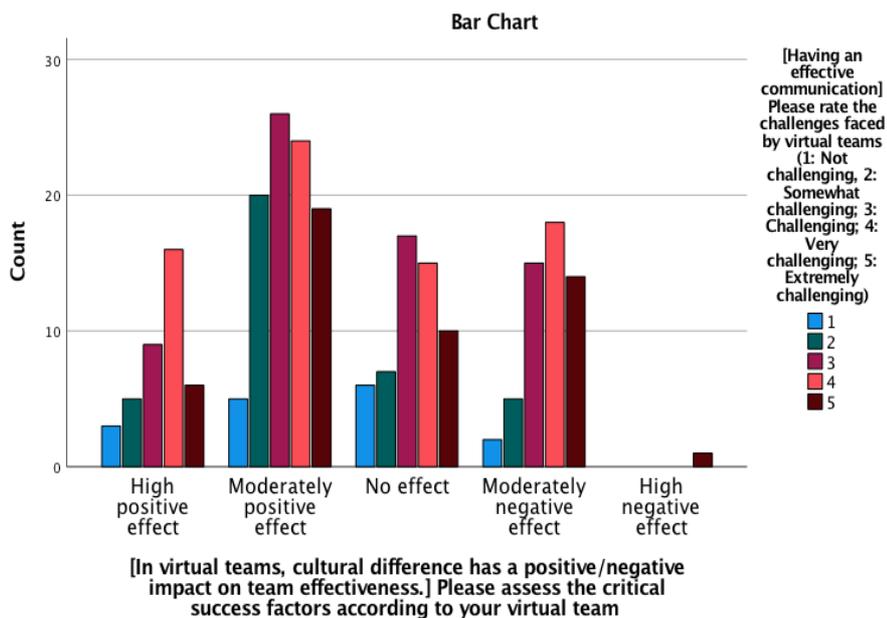
cultural difference has positive impact on team effectiveness and managing conflict was found somewhat challenging (58.1%).



Relation between cultural difference and establishing trust and relationship

Having an effective communication

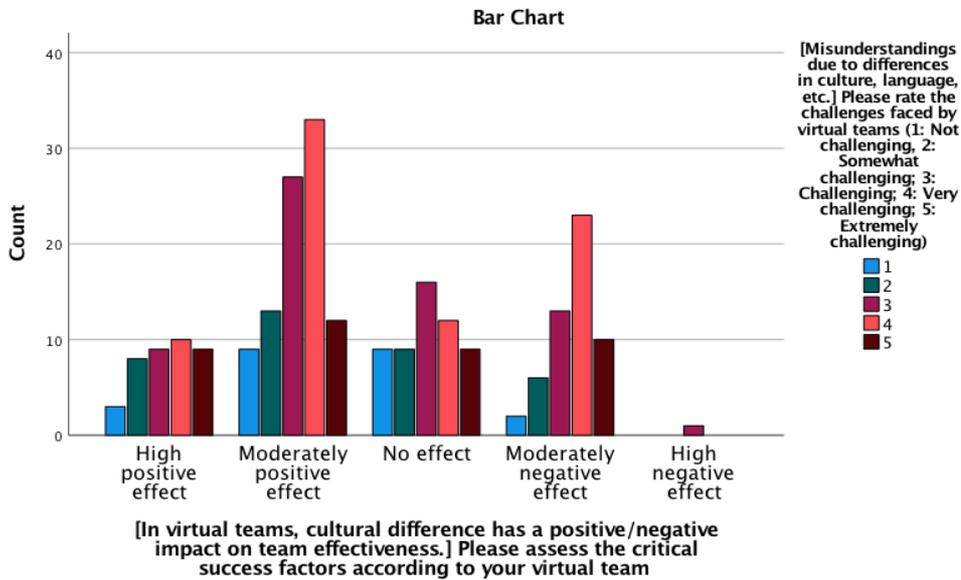
To compare the relation between cultural difference and having an effective communication, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and having an effective communication, $X^2(16, N = 243) = 14.769, p = .542$, thus, cultural difference has positive impact on team effectiveness and having an effective communication was found challenging (38.8%).



Relation between cultural difference and effective communication

Misunderstandings due to differences in culture, language, etc.

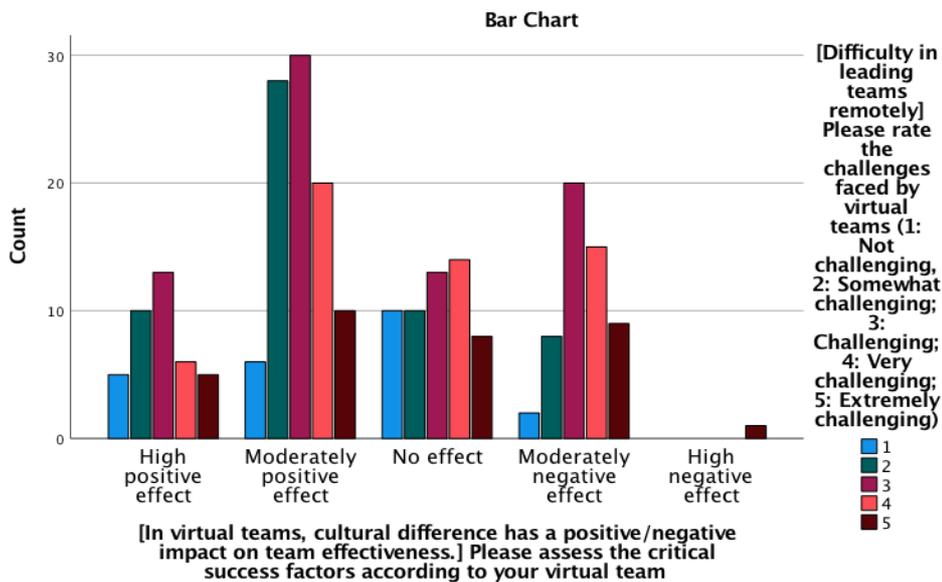
To compare the relation between cultural differences and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between cultural differences and misunderstandings due to differences, $X^2(16, N = 243) = 15.957, p = .456$, and misunderstandings due to differences were found very challenging (42.3%).



Relation between cultural differences and misunderstandings

Difficulty in leading teams remotely

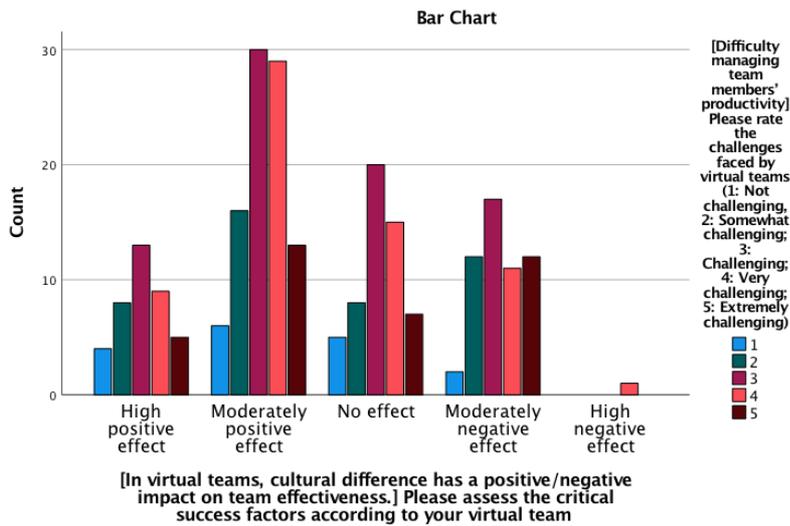
To compare the relation between cultural difference and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 22.703, p = .122$, and difficulty in leading teams remotely was found challenging (39.5%).



Relation between cultural difference and leading teams remotely

Difficulty managing team members’ productivity

To compare the relation between cultural difference and difficulty managing team members’ productivity, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and difficulty managing team members’ productivity, $X^2(16, N = 243) = 9.747, p = .879$, and difficulty managing team members’ productivity was found challenging (37.5%).

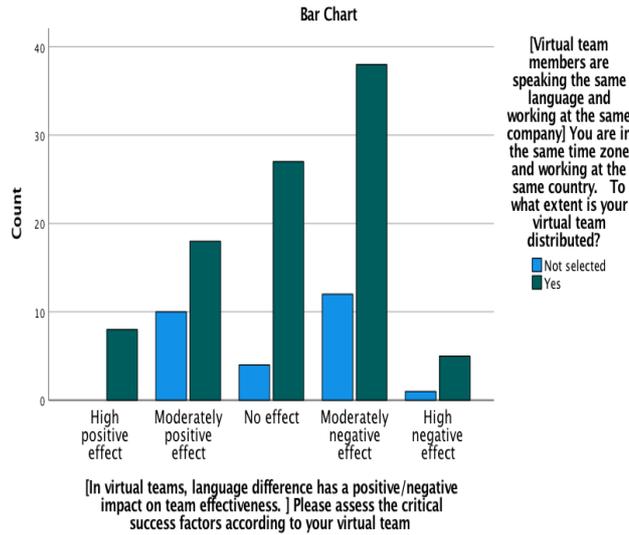


Relation between cultural difference and managing team members’ productivity

Appendix 23. H5 & You are in the same time zone and working at the same country

Virtual team members are speaking the same language and working at the same company

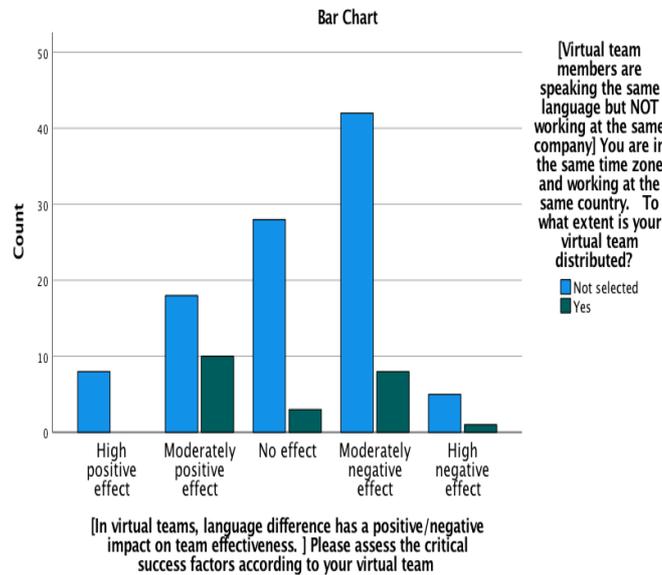
To compare the same language, same company cases and language difference, Chi-square test was conducted. There was no significant difference between the same language, same company cases and language difference, $X^2(4, N = 123) = 7.047, p = .133$, virtual team members who are speaking the same language and working at the same company rated that language difference has a negative effect on team effectiveness.



Relationship between same language same company and team effectiveness

Virtual team members are speaking the same language but NOT working at the same company

To compare the same language, different company cases and language difference, Chi-square test was conducted. There was no significant difference between the same language, same company cases and language difference, $X^2(4, N = 123) = 9.352, p = .053$, virtual team members who are speaking the same language and working at different company rated that language difference has a positive effect on team effectiveness.

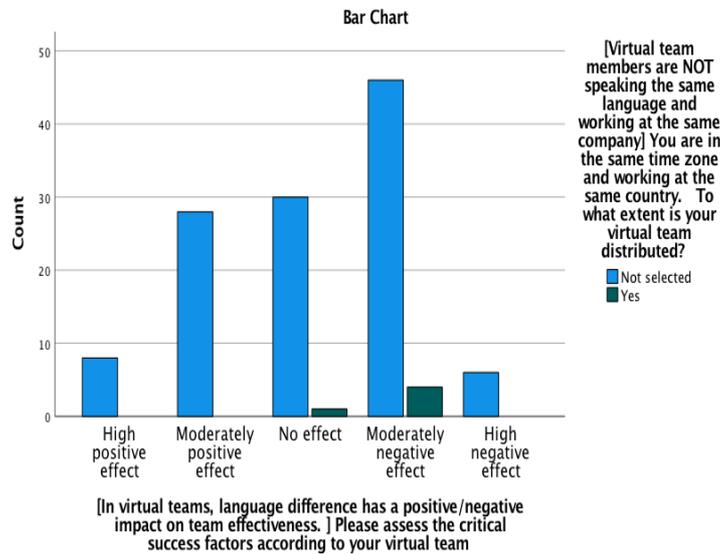


Relationship between same language different company and team effectiveness

Virtual team members are NOT speaking the same language and working at the same company

Appendix

To compare the different language, same company cases and language difference, Chi-square test was conducted. There was no significant difference between the different language, same company cases and language difference, $X^2(4, N = 123) = 3.821, p = .431$, virtual team members who are speaking different language and working at the same company rated that language difference has a negative effect on team effectiveness.

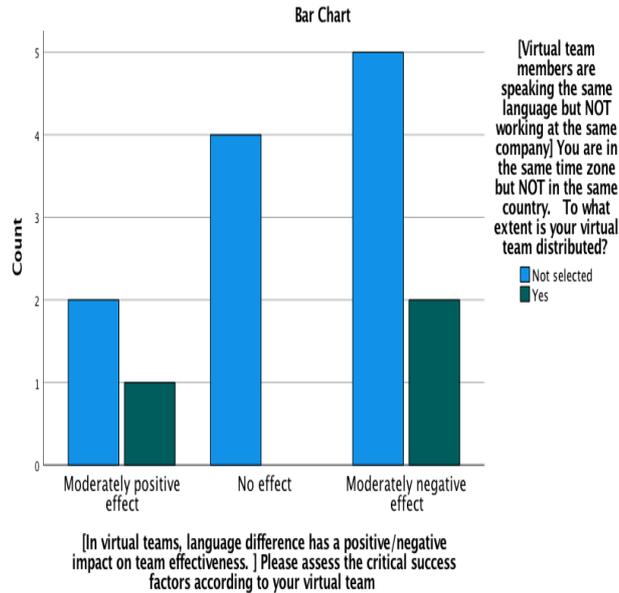


Relationship between different language same company and team effectiveness

Appendix 24. H5 & You are in the same time zone but NOT in the same country

Virtual team members are speaking the same language but NOT working at the same company

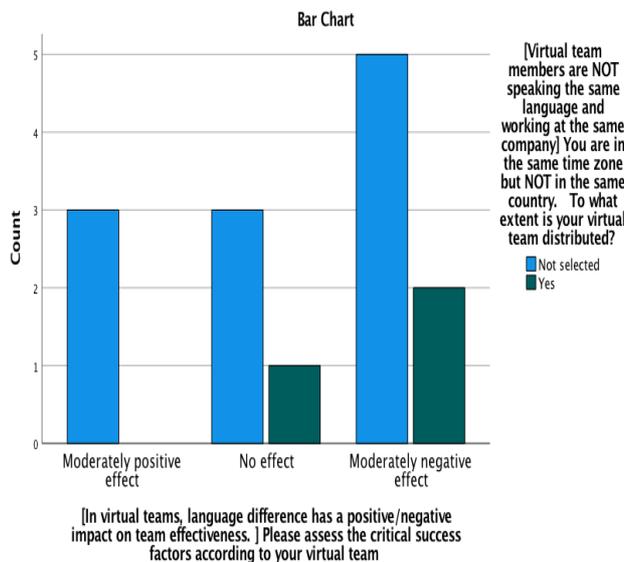
To compare the same language, different company cases and language difference, Chi-square test was conducted. There was no significant difference between the same language, different company cases and language difference, $X^2(2, N = 14) = 1.556, p = .459$, virtual team members who are speaking the same language and working at different company rated that language difference has a negative effect on team effectiveness.



Relationship between same language different company and team effectiveness

Virtual team members are NOT speaking the same language and working at the same company

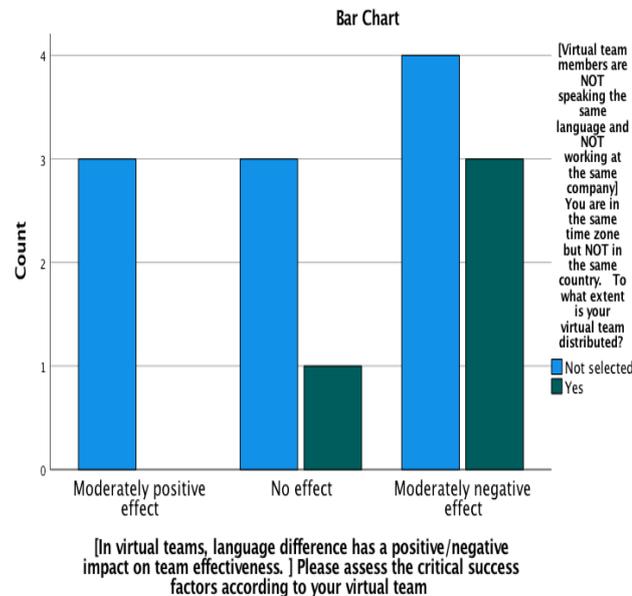
To compare the different language, same company cases and language difference, Chi-square test was conducted. There was no significant difference between the different language, same company cases and language difference, $X^2(2, N = 14) = 1.061, p = .588$, virtual team members who are speaking different language and working at the same company rated that language difference has a negative effect on team effectiveness.



Relationship between different language same company and team effectiveness

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases and language difference, Chi-square test was conducted. There was no significant difference between the s different language, different company cases and language difference, $X^2(2, N = 14) = 1.925, p = .382$, virtual team members who are speaking different language and working at different company rated that language difference has a negative effect on team effectiveness.



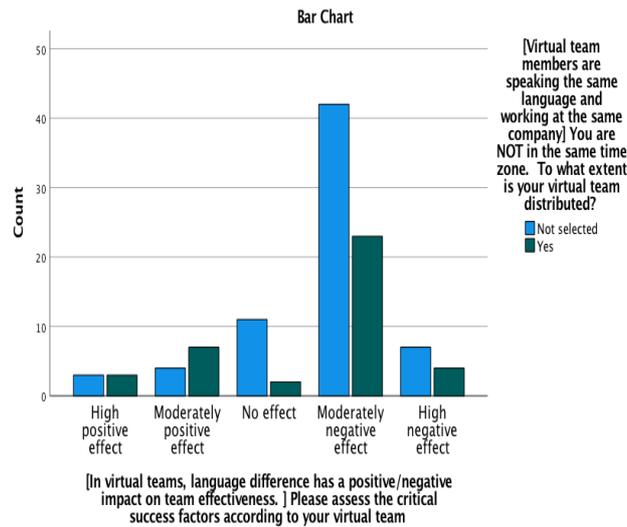
Relationship between different language different company and team effectiveness

Appendix 25. H5 & You are in the same time zone but NOT in the same country

Virtual team members are speaking the same language and working at the same company

To compare the same language, same company cases and language difference, Chi-square test was conducted. There was no significant difference between the same language, same company cases and language difference, $X^2(4, N = 106) = 6.477, p = .166$, virtual team members who are speaking the same language and working at the same company rated that language difference has a negative effect on team effectiveness.

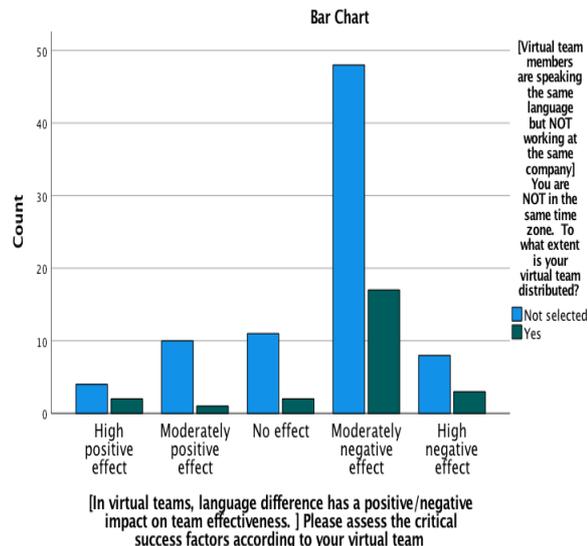
Appendix



Relationship between same language same company and team effectiveness

Virtual team members are speaking the same language but NOT working at the same company

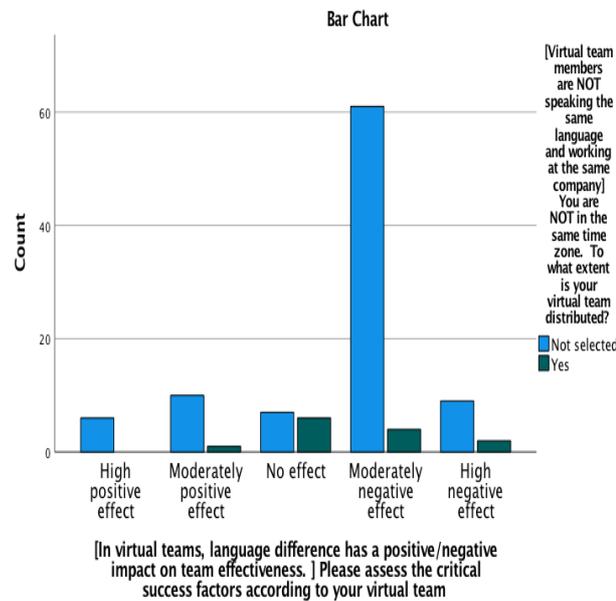
To compare the same language, different company cases and language difference, Chi-square test was conducted. There was no significant difference between the same language, different company cases and language difference, $X^2(4, N = 106) = 2.405, p = .662$, virtual team members who are speaking the same language and working at different company rated that language difference has a negative effect on team effectiveness.



Relationship between same language different company and team effectiveness

Virtual team members are NOT speaking the same language and working at the same company

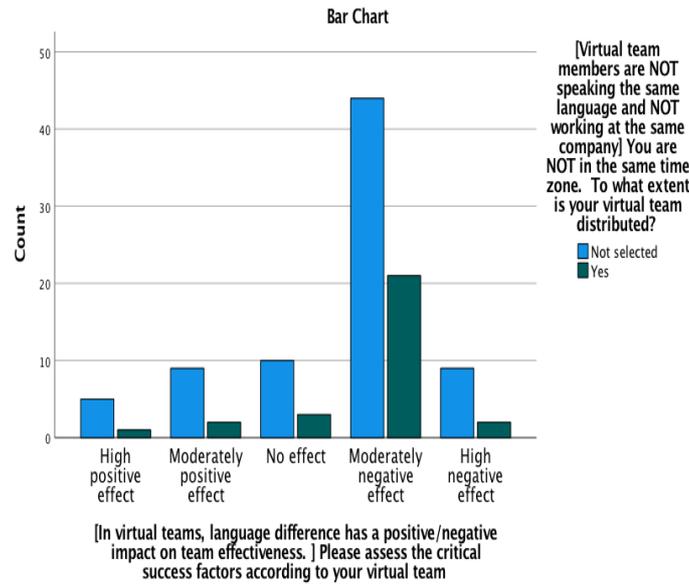
To compare the different language, same company cases and language difference, Chi-square test was conducted. There was a significant difference between the different language, same company cases and language difference, $X^2(4, N = 106) = 17.431, p = .002$, virtual team members who are speaking different language and working at the same company rated that language difference has no effect on team effectiveness.



Relationship between different language same and team effectiveness

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases and language difference, Chi-square test was conducted. There was no significant difference between the different language, different company cases and language difference, $X^2(4, N = 106) = 2.198, p = .699$, virtual team members who are speaking different language and working at different company rated that language difference has a negative effect on team effectiveness.

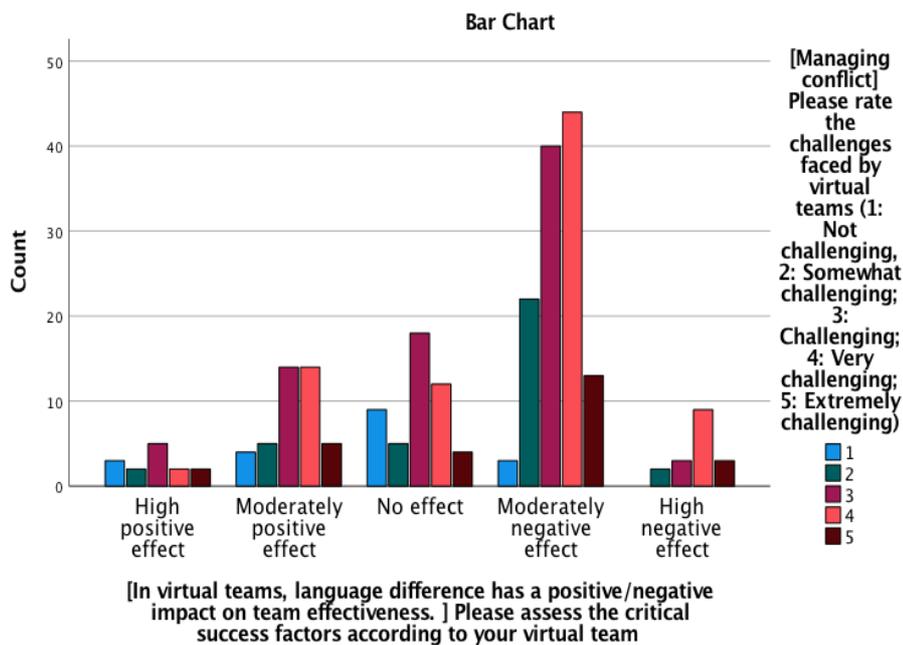


Relationship between different language different company and team effectiveness

Appendix 26. Comparing the Challenges with Hypothesis 5

Managing conflict

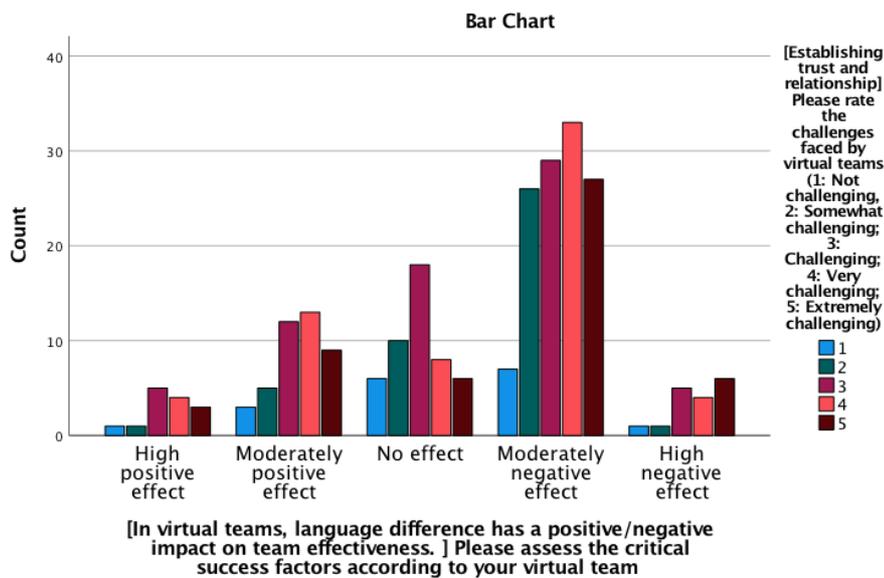
To compare the relation between language difference and managing conflict, Chi-square test was conducted. Frequencies were not significantly different between language difference and managing conflict, $X^2(16, N = 243) = 2.198, p = .055$, and managing conflict was found very challenging (54.3%).



Relation between language difference and managing conflict

Establishing trust and relationship

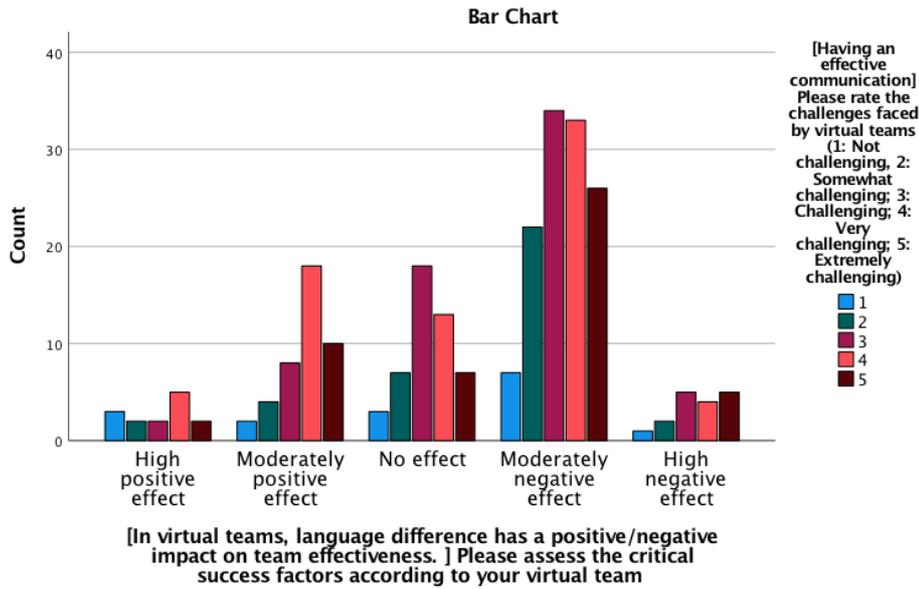
To compare the relation between language difference and establishing trust and relationship, Chi-square test was conducted. Frequencies were not significantly different between language difference and establishing trust and relationship, $X^2(16, N = 243) = 14.512, p = .561$, and establishing trust and relationship was found very challenging (53.2%).



Relation between language difference and establishing trust and relationship

Having an effective communication

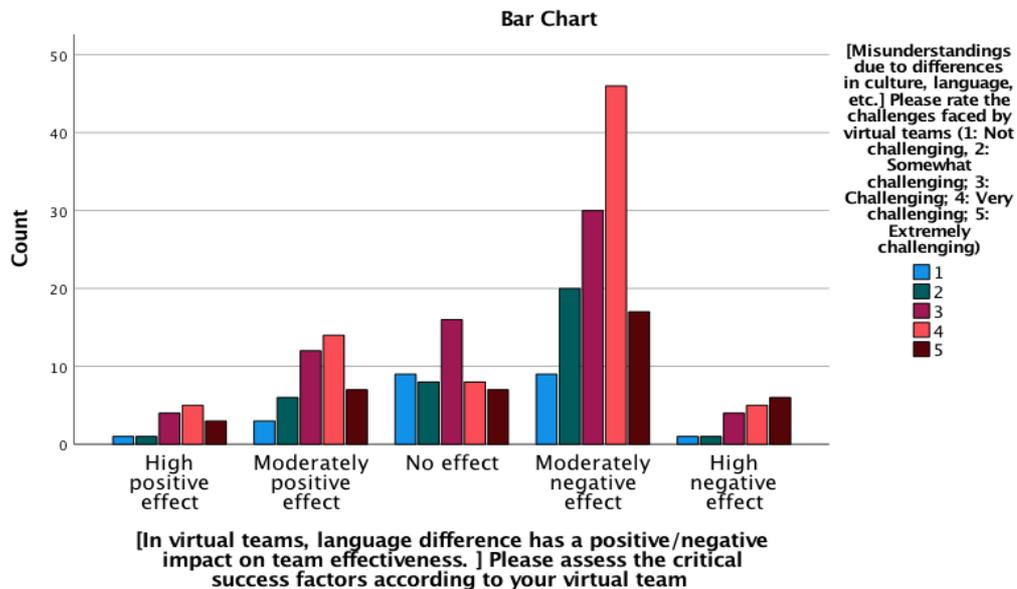
To compare the relation between language difference and having an effective communication, Chi-square test was conducted. Frequencies were not significantly different between language difference and having an effective communication, $X^2(16, N = 243) = 15.665, p = .477$, and having an effective communication was found challenging (50.7%).



Relation between language difference and effective communication

Misunderstandings due to differences in culture, language

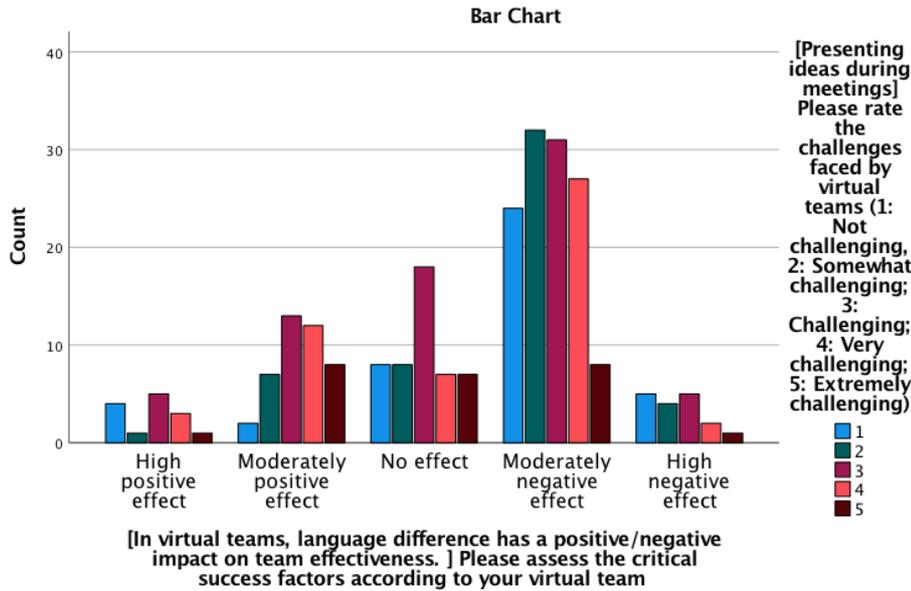
To compare the relation between language difference and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between language difference and misunderstandings due to differences, $X^2(16, N = 243) = 17.694, p = .342$, and misunderstandings due to differences was found very challenging (59.0%).



Relation between language difference and misunderstandings

Presenting ideas during meetings

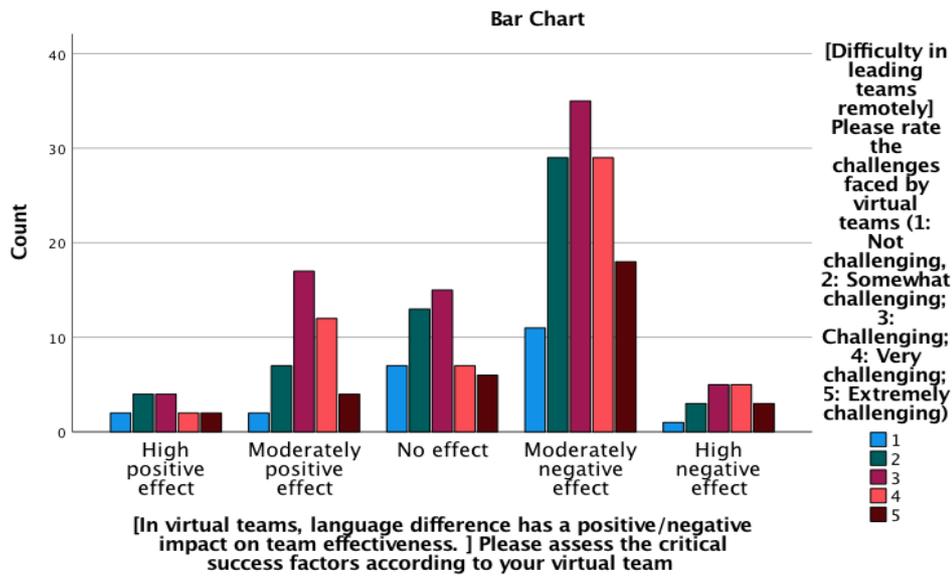
To compare the relation between language difference and presenting ideas during meetings, Chi-square test was conducted. Frequencies were not significantly different between language difference and presenting ideas during meetings, $X^2(16, N = 243) = 21.052, p = .177$, and presenting ideas during meetings was found somewhat challenging (61.5%).



Relation between language difference and presenting ideas

Difficulty in leading teams remotely

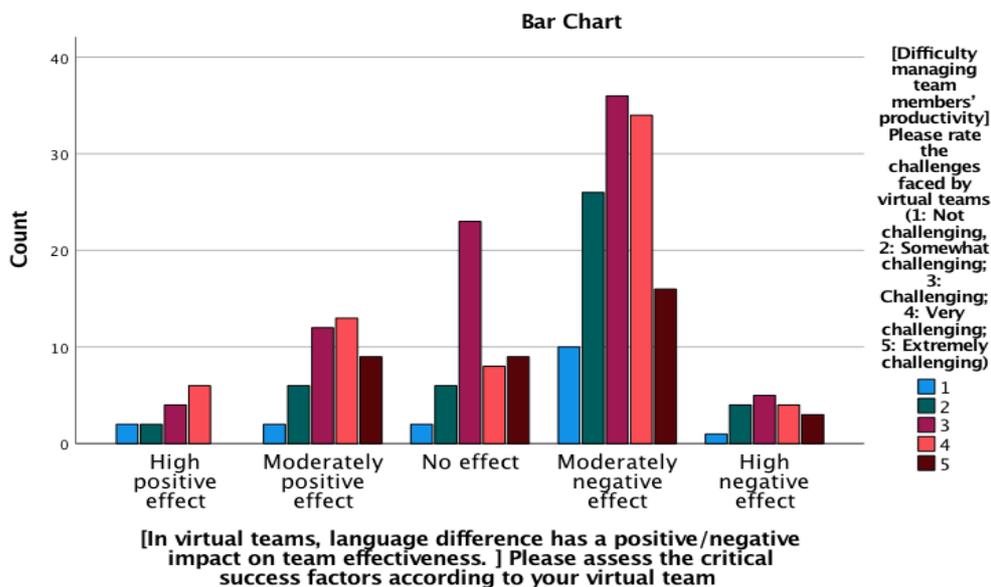
To compare the relation between language difference and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were not significantly different between language difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 9.630, p = .885$, and difficulty in leading teams remotely was found challenging (46.1%).



Relation between language difference and leading teams remotely

Difficulty managing team members’ productivity

To compare the relation between language difference and difficulty managing team members’ productivity, Chi-square test was conducted. Frequencies were not significantly different between language difference and difficulty managing team members’ productivity, $X^2(16, N = 243) = 16.132, p = .444$, and difficulty managing team members’ productivity was found challenging (46.1%).

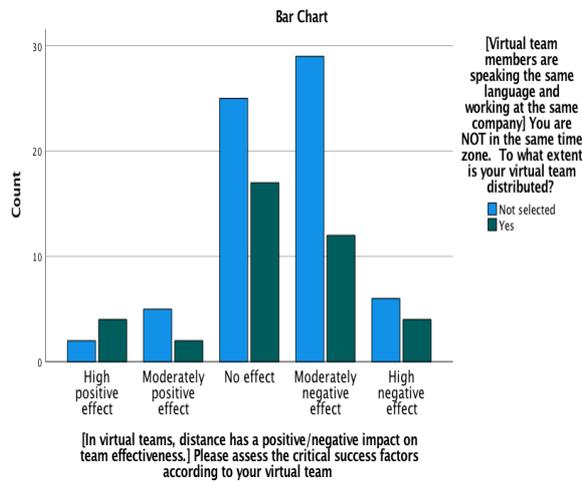


Relation between language difference and managing team members` productivity

Appendix 27. H6 & You are NOT in the same time zone

Virtual team members are speaking the same language and working at the same company

To compare the same language, same company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, same company cases and distance, $X^2(4, N = 106) = 3.793, p = .435$, virtual team members who are speaking the same language and working at the same company rated that distance has no effect on team effectiveness.

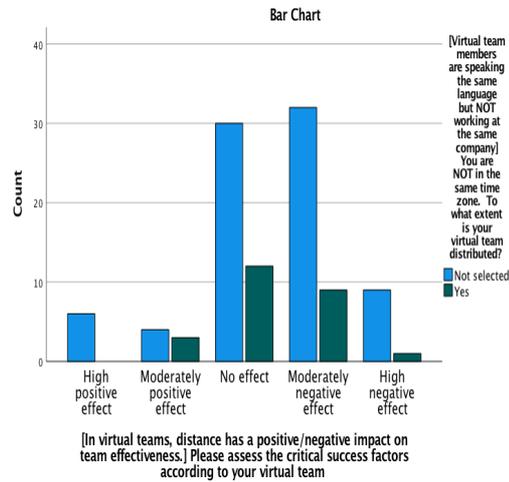


Relationship between same language same company and team effectiveness

Virtual team members are speaking the same language but NOT working at the same company

To compare the same language, different company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, different company cases and distance, $X^2(4, N = 106) = 4.959, p = .292$, virtual team members who are speaking the same language and working at different company rated that distance has no effect on team effectiveness.

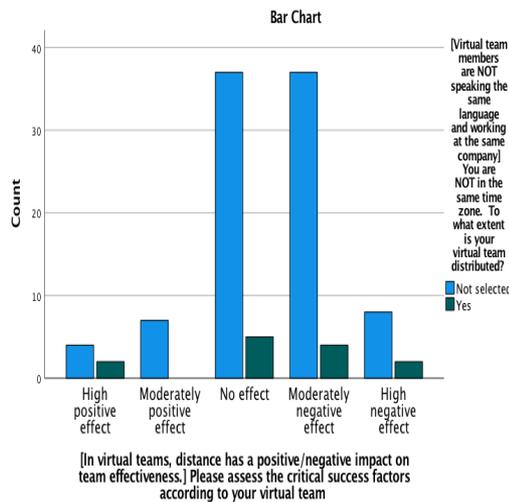
Appendix



Relationship between same language different company and team effectiveness

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases and distance, Chi-square test was conducted. There was no significant difference between the different language, same company cases and distance, $X^2(4, N = 106) = 4.255, p = .373$, virtual team members who are speaking different language and working at the same company rated that distance has no effect on team effectiveness.



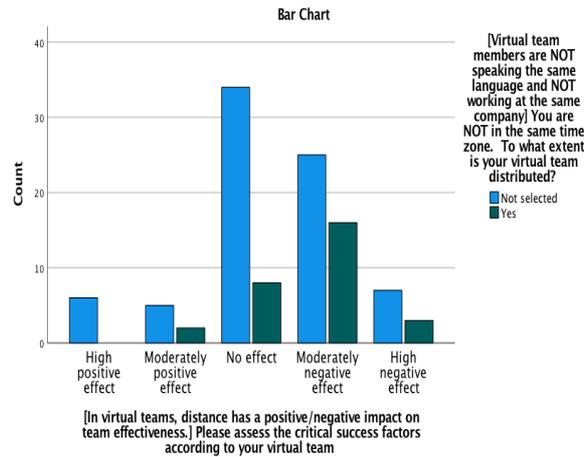
Relationship between different language same company and team effectiveness

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases and distance, Chi-square test was conducted. There was no significant difference between the different language, different company cases and distance, $X^2(4, N = 106) = 6.567, p = .161$, virtual team members who are

Appendix

speaking different language and working at different company rated that distance has a moderately negative effect on team effectiveness.

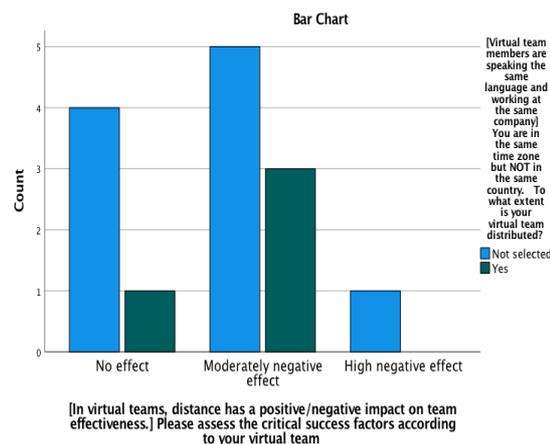


Relationship between different language different company and team effectiveness

Appendix 28. H6 & You are in the same time zone but NOT in the same country

Virtual team members are speaking the same language and working at the same company

To compare the same language, same company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, same company cases and distance, $X^2(2, N = 14) = .893, p = .640$, virtual team members who are speaking the same language and working at the same company rated that distance has a moderately negative effect on team effectiveness.

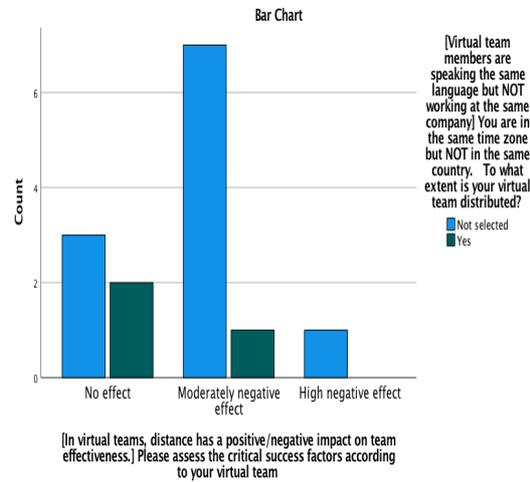


Relationship between same language same company and team effectiveness

Virtual team members are speaking the same language but NOT working at the same company

Appendix

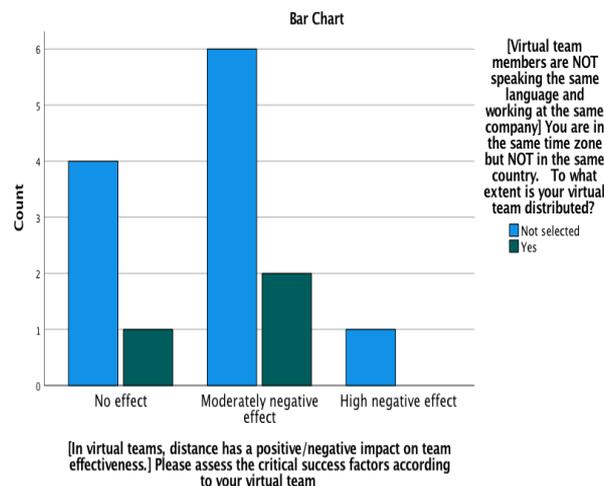
To compare the same language, different company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, different company cases and distance, $X^2(2, N = 14) = 1.676, p = .433$, virtual team members who are speaking the same language and working at different company rated that distance has no effect on team effectiveness.



Relationship between same language different company and team effectiveness

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases and distance, Chi-square test was conducted. There was no significant difference between the different language, same company cases and distance, $X^2(2, N = 14) = .339, p = .844$, virtual team members who are speaking the different language and working at the same company rated that distance has a moderately negative effect on team effectiveness.

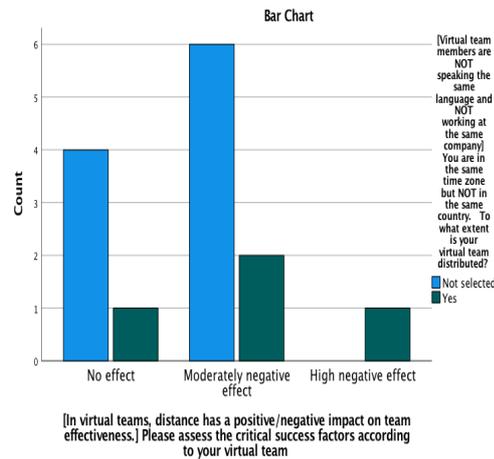


Relationship between different language same company and team effectiveness

Appendix

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases and distance, Chi-square test was conducted. There was no significant difference between the different language, different company cases and distance, $X^2(2, N = 14) = 2.730, p = .255$, virtual team members who are speaking the different language and working at different company rated that distance has a moderately negative effect on team effectiveness.



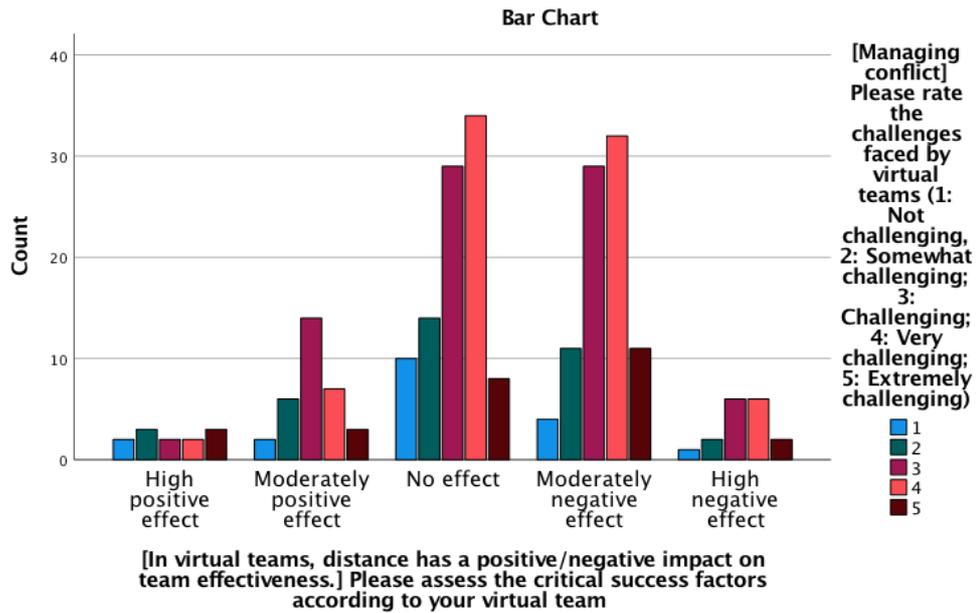
Relationship between different language different company and team effectiveness

Appendix 29. Comparing the Challenges with Hypothesis 6

Managing conflict

To compare the relation between distance and managing conflict, Chi-square test was conducted. Frequencies were not significantly different between distance and managing conflict, $X^2(16, N = 243) = 13.031, p = .670$, and managing conflict was found very challenging (39.5%).

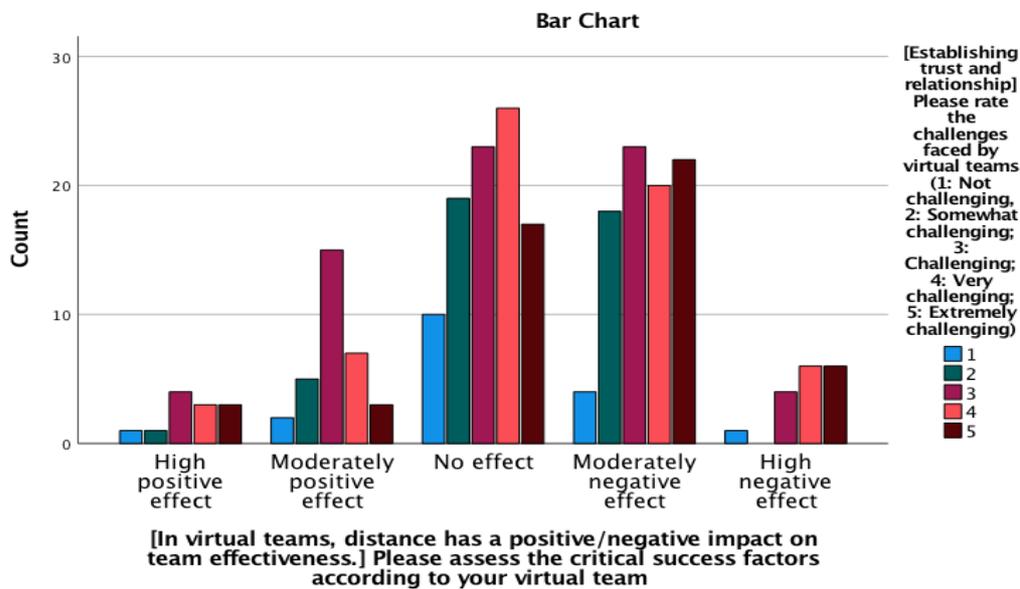
Appendix



Relation between distance and managing conflict

Establishing trust and relationship

To compare the relation between distance and establishing trust and relationship, Chi-square test was conducted. Frequencies were not significantly different between distance and establishing trust and relationship, $X^2(16, N = 243) = 17.658, p = .344$, and establishing trust and relationship was found very challenging.

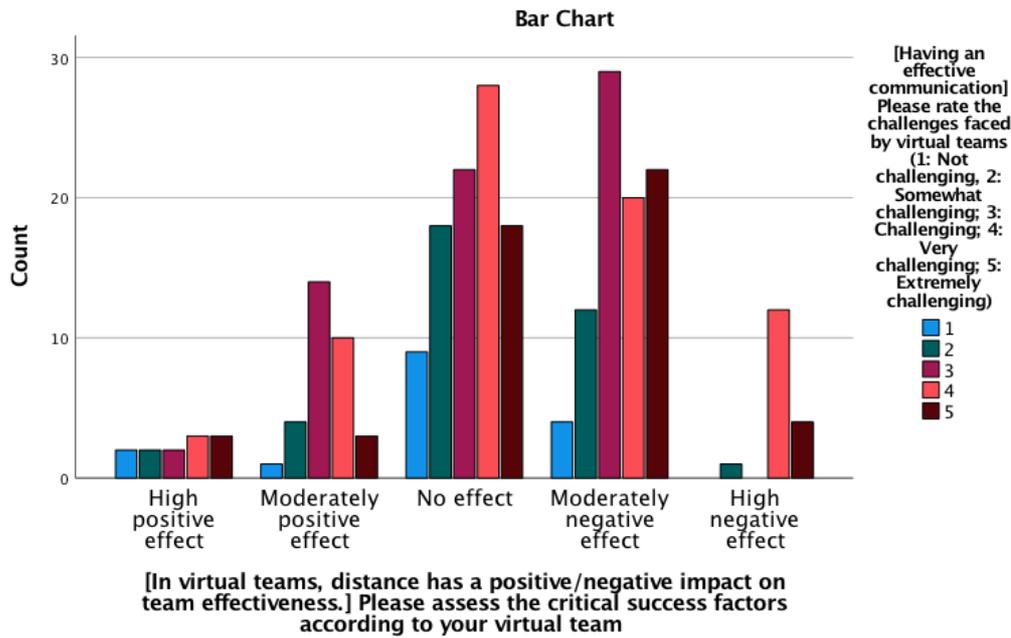


Relation between distance and establishing trust and relationship

Having an effective communication

The relation between distance and having effective communication were significant, $X^2(16, N = 243) = 31.439, p = .012$, and having an effective communication was found challenging.

Appendix

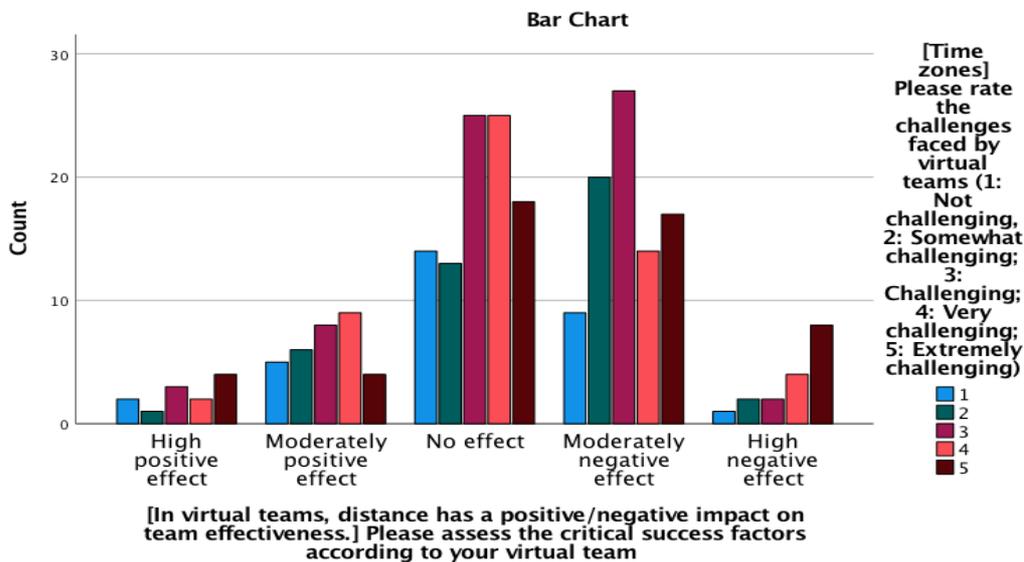


Relation between distance and effective communication

Time zones

To compare the relation between distance and time zones, Chi-square test was conducted.

Frequencies were not significantly different between distance and time zones, $X^2(16, N = 243) = 17.616, p = .347$, and time zones were found challenging.



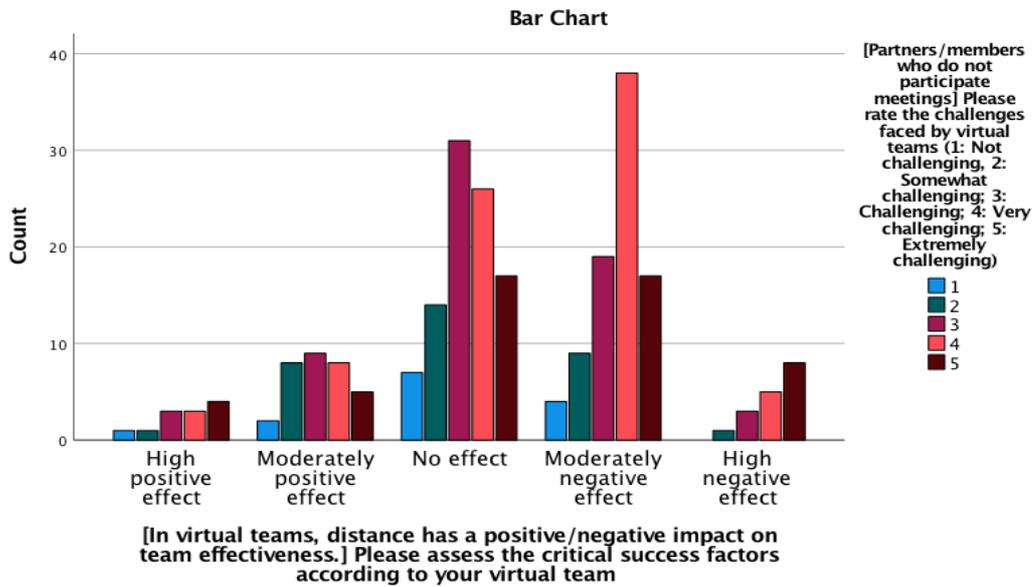
Relation between distance and time zones

Partners/members who do not participate meetings

To compare the relation between distance and partners/members who do not participate meetings, Chi-square test was conducted. Frequencies were not significantly different between

Appendix

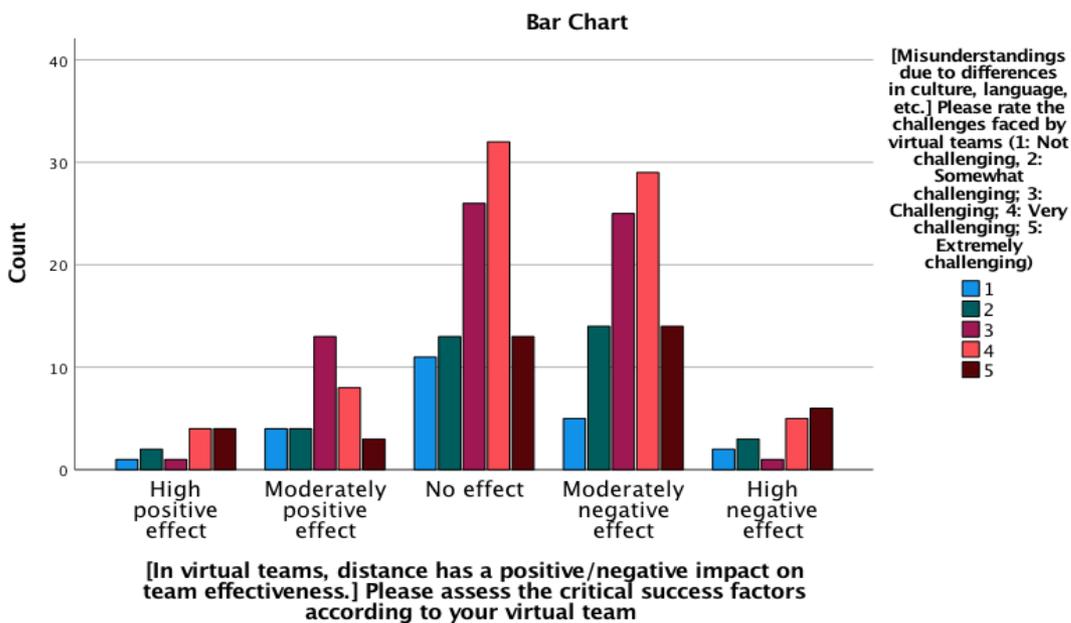
distance and partners/members who do not participate meetings, $X^2(16, N = 243) = 21.344, p = .166$, and partners/members who do not participate meetings were found very challenging.



Relation between distance and partners/members who do not participate meetings

Misunderstandings due to differences in culture, language

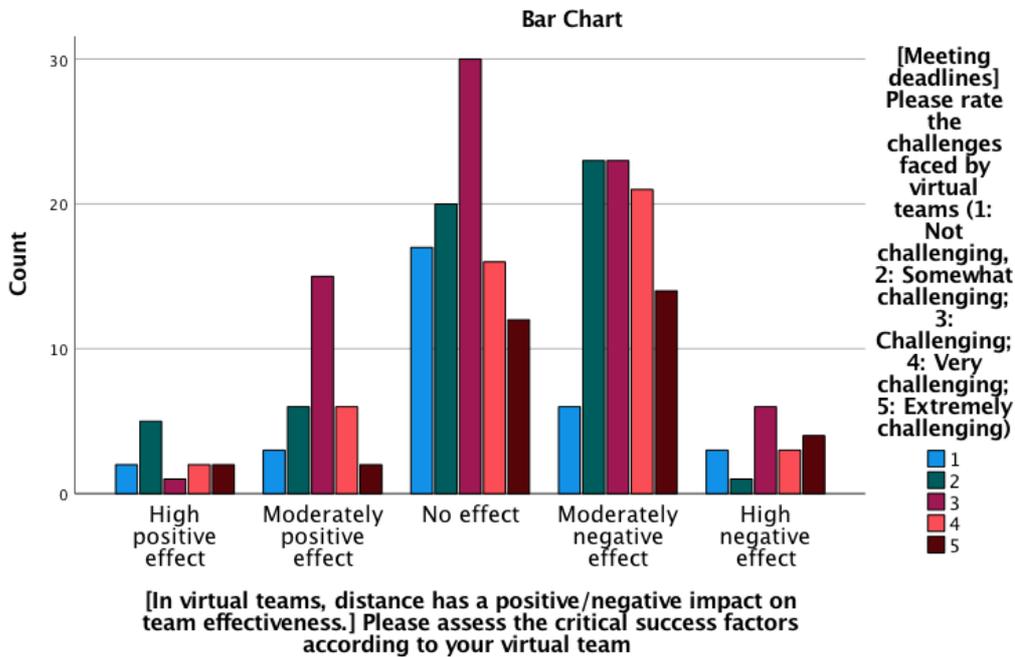
To compare the relation between distance and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between distance and misunderstandings due to differences, $X^2(16, N = 243) = 17.001, p = .386$, and misunderstandings due to differences were found very challenging.



Relation between distance and misunderstandings

Meeting deadlines

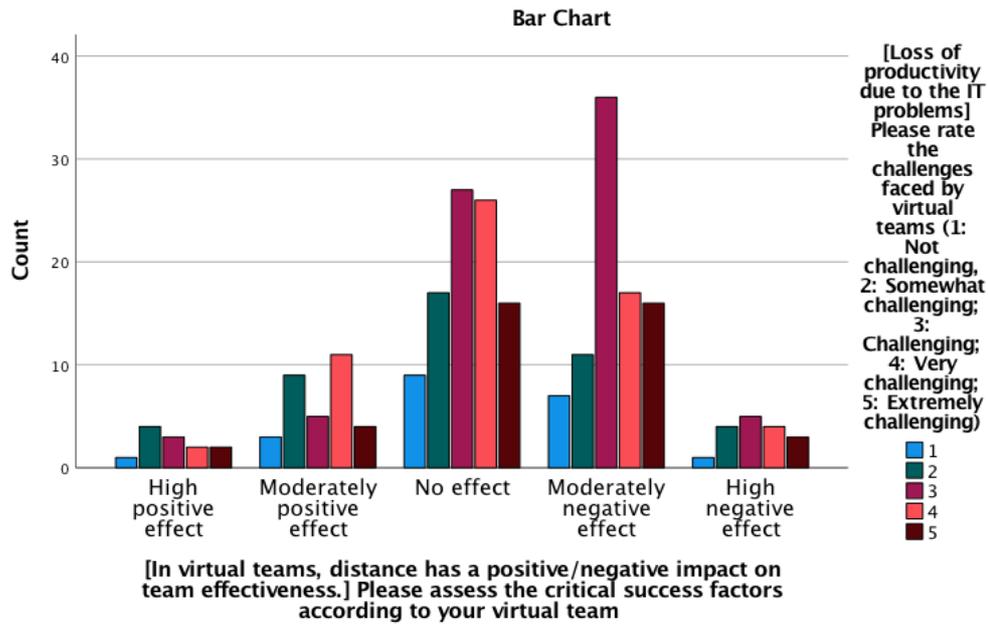
To compare the relation between distance and meeting deadlines, Chi-square test was conducted. Frequencies were not significantly different between distance and meeting deadlines, $X^2(16, N = 243) = 19.571, p = .240$, and meeting deadlines were found challenging.



Relation between distance and meeting deadlines

Loss of productivity due to the IT problems

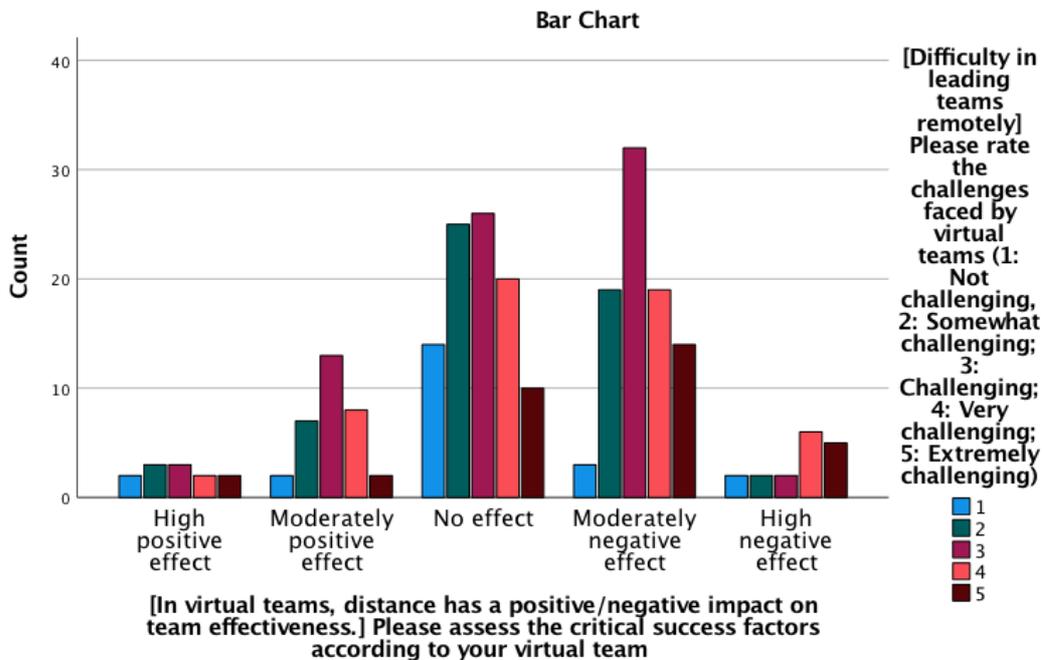
To compare the relation between distance and loss of productivity due to the IT problems, Chi-square test was conducted. Frequencies were not significantly different between distance and loss of productivity due to the IT problems, $X^2(16, N = 243) = 14.171, p = .586$, and loss of productivity due to the IT problems were found challenging.



Relation between distance and loss of productivity due to IT problems

Difficulty in leading teams remotely

To compare the relation between distance and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were not significantly different between distance and difficulty in leading teams remotely, $X^2(16, N = 243) = 20.260, p = .209$, and difficulty in leading teams remotely were found challenging.

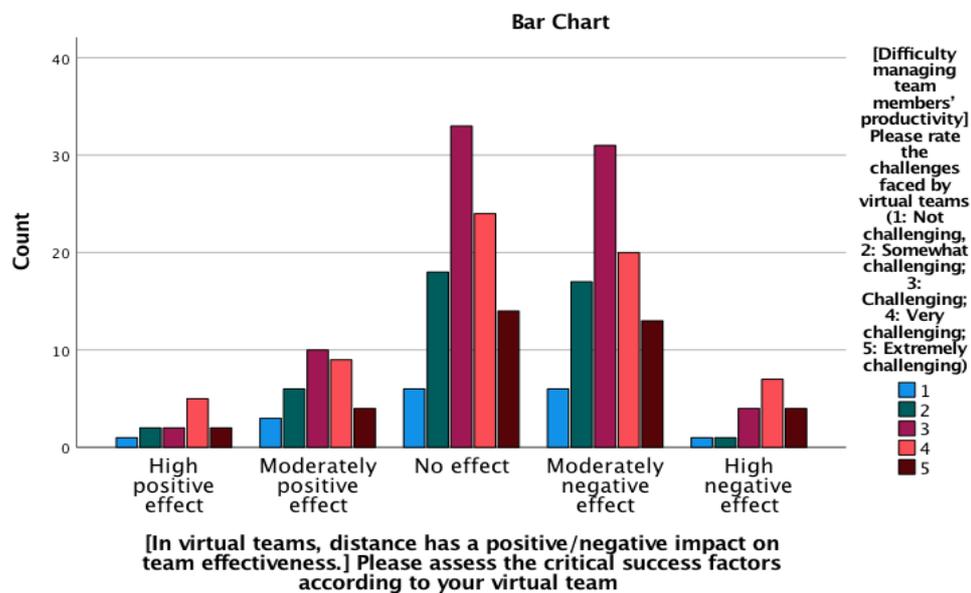


Relation between distance and leading teams remotely

Appendix

Difficulty managing team members' productivity

To compare the relation between distance and difficulty managing team members' productivity, Chi-square test was conducted. Frequencies were not significantly different between distance and difficulty managing team members' productivity, $X^2(16, N = 243) = 7.523, p = .962$, and difficulty managing team members' productivity were found challenging.



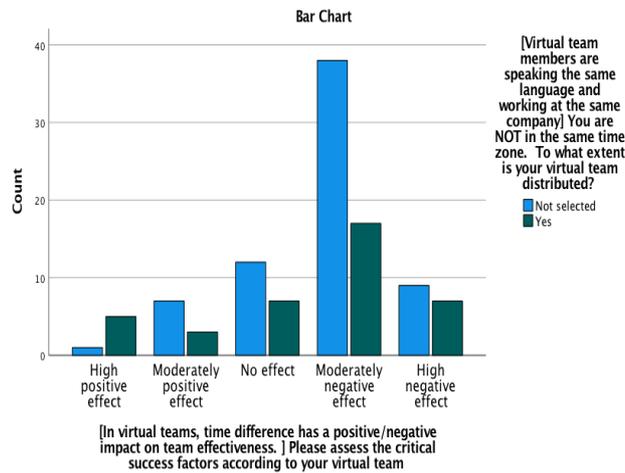
Relation between distance and managing team members' productivity

Appendix 30. H7 & You are NOT in the same time zone

Virtual team members are speaking the same language and working at the same company

To compare the same language, same company cases and time difference, Chi-square test was conducted. There was no significant difference between the same language, same company cases and time difference, $X^2(4, N = 106) = 6.939, p = .139$, virtual team members who are speaking the same language and working at the same company rated that time difference has a negative effect on team effectiveness.

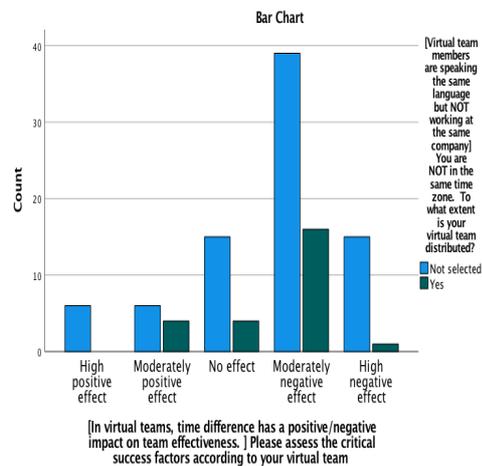
Appendix



Relationship between same language same company and team effectiveness

Virtual team members are speaking the same language but NOT working at the same company

To compare the same language, different company cases and time difference, Chi-square test was conducted. There was no significant difference between the same language, different company cases and time difference, $X^2(4, N = 106) = 7.008, p = .135$, virtual team members who are speaking the same language and working at different company rated that time difference has a negative effect on team effectiveness.



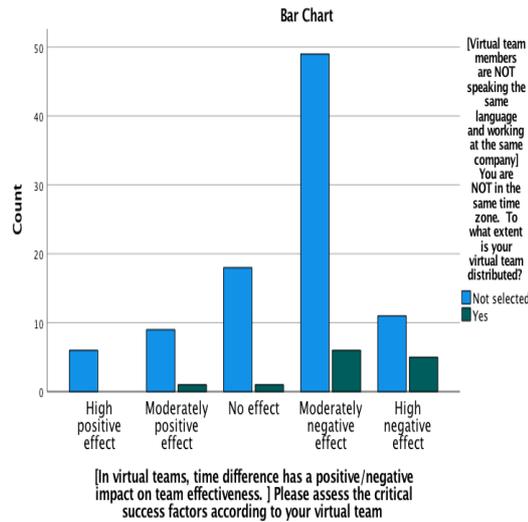
Relationship between same language different company and team effectiveness

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases and time difference, Chi-square test was conducted. There was no significant difference between the different language, same company cases and time difference, $X^2(4, N = 106) = 7.206, p = .125$, virtual team members

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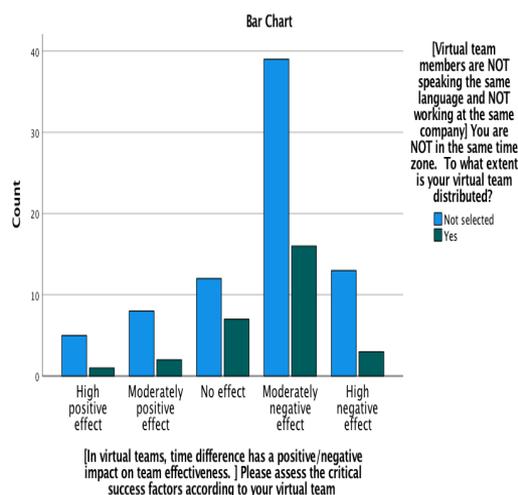
who are speaking different language and working at the same company rated that time difference has a negative effect on team effectiveness.



Relationship between different language same company and team effectiveness

Virtual team members are NOT speaking the same language and NOT working at the same company

Time difference has a negative impact on team effectiveness. To compare the different language, different company cases and time difference, Chi-square test was conducted. There was no significant difference between the different language, different company cases and time difference, $X^2(4, N = 106) = 2.157, p = .707$, virtual team members who are speaking different language and working at different company rated that time difference has a negative effect on team effectiveness.

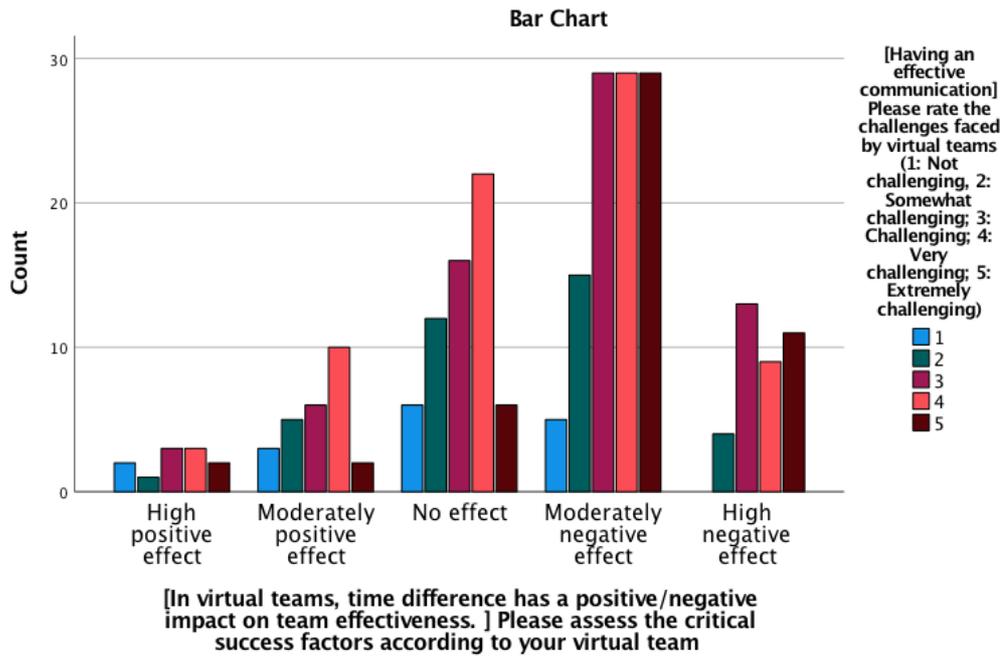


Relationship between different language different company and team effectiveness

Appendix 31. Comparing the Challenges with Hypothesis 7

Having an effective communication

To compare the relation between time difference and having an effective communication, Chi-square test was conducted. Frequencies were not significantly different between time difference and having an effective communication, $X^2(16, N = 243) = 21.392, p = .164$, and having an effective communication was found extremely challenging (58.0%).

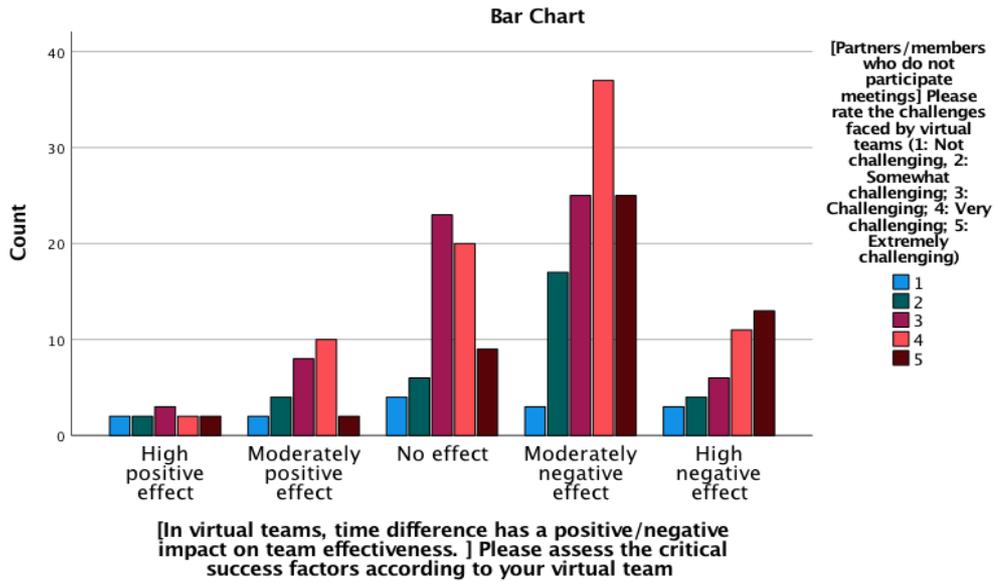


Relation between time difference and effective communication

Partners/members who do not participate meetings

To compare the relation between time difference and partners/members who do not participate meetings, Chi-square test was conducted. Frequencies were not significantly different between time difference and partners/members who do not participate meetings, $X^2(16, N = 243) = 19.799, p = .229$, and partners/members who do not participate meetings was found very challenging (46.3%).

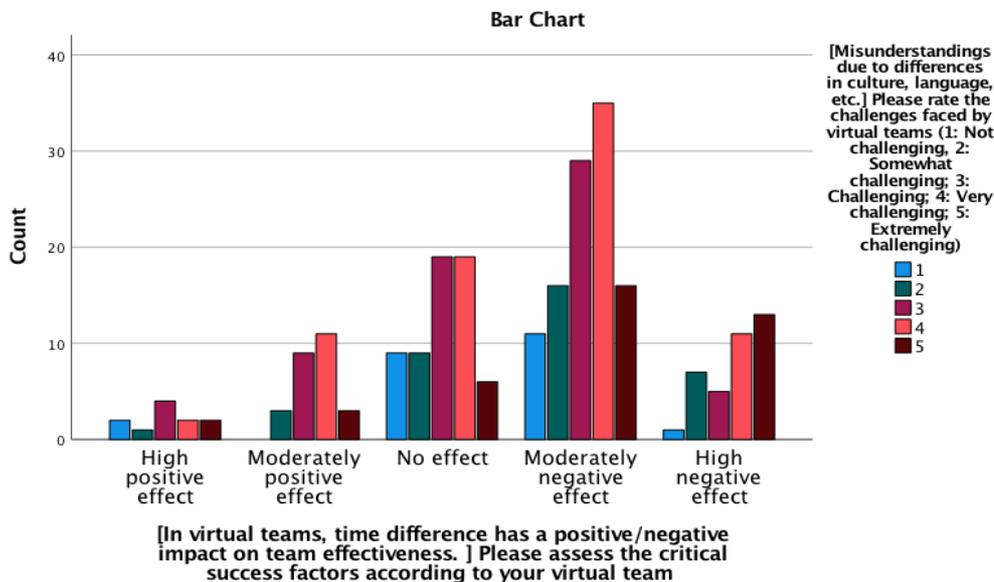
Appendix



Relation between time difference and Partners/members who do not participate meetings

Misunderstandings due to differences in culture, language

To compare the relation between time difference and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between time difference and misunderstandings due to differences, $X^2(16, N = 243) = 23.173, p = .109$, and misunderstandings due to differences was found very challenging (44.9%).



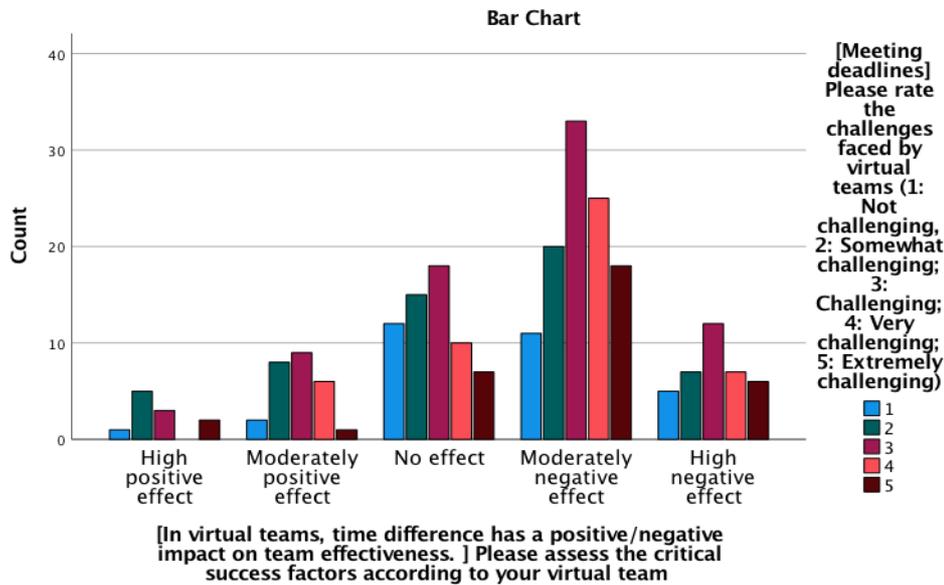
Relation between time difference and misunderstandings

Meeting deadlines

To compare the relation between time difference and meeting deadlines, Chi-square test was conducted. Frequencies were not significantly different between time difference and meeting

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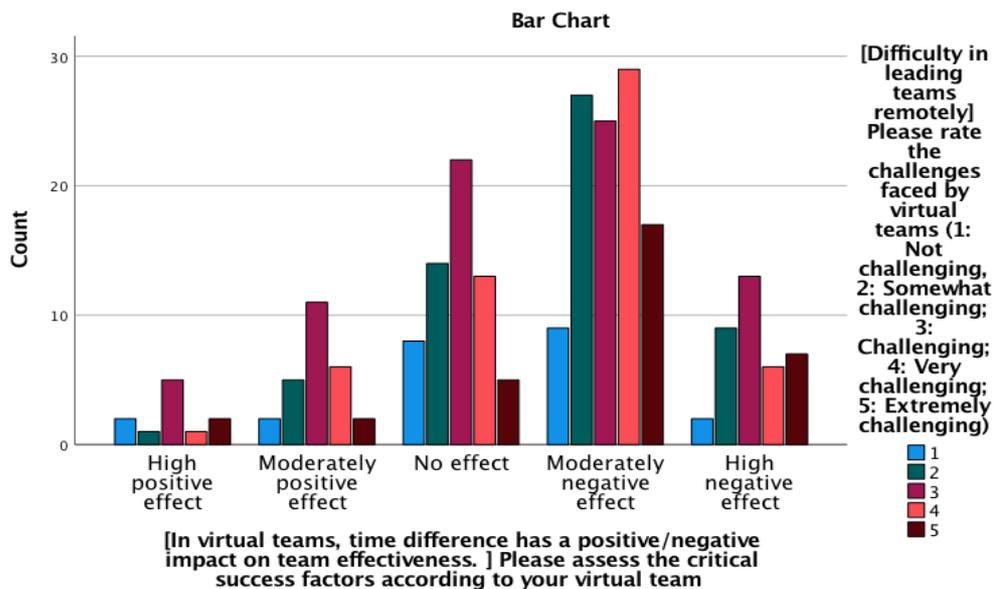
deadlines, $X^2(16, N = 243) = 14.433, p = .567$, and meeting deadlines was found challenging (44.0%).



Relation between time difference and meeting deadlines

Difficulty in leading teams remotely

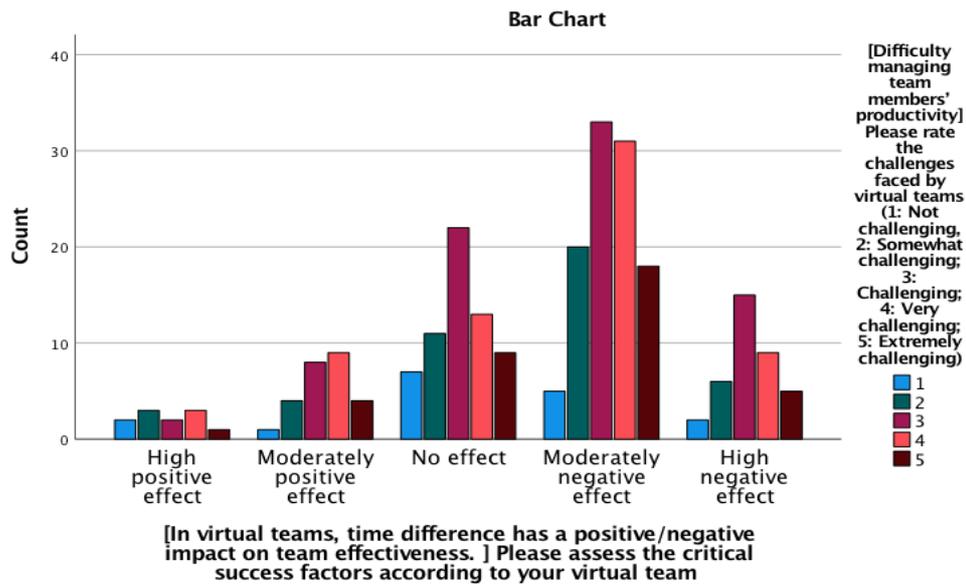
To compare the relation between time difference and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were not significantly different between time difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 14.256, p = .580$, and difficulty in leading teams remotely was found very challenging (52.7%).



Relation between time difference and leading teams remotely

Difficulty managing team members' productivity

To compare the relation between time difference and difficulty managing team members' productivity, Chi-square test was conducted. Frequencies were not significantly different between time difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 9.523, p = .890$, and difficulty managing team members' productivity was found challenging (41.3%).

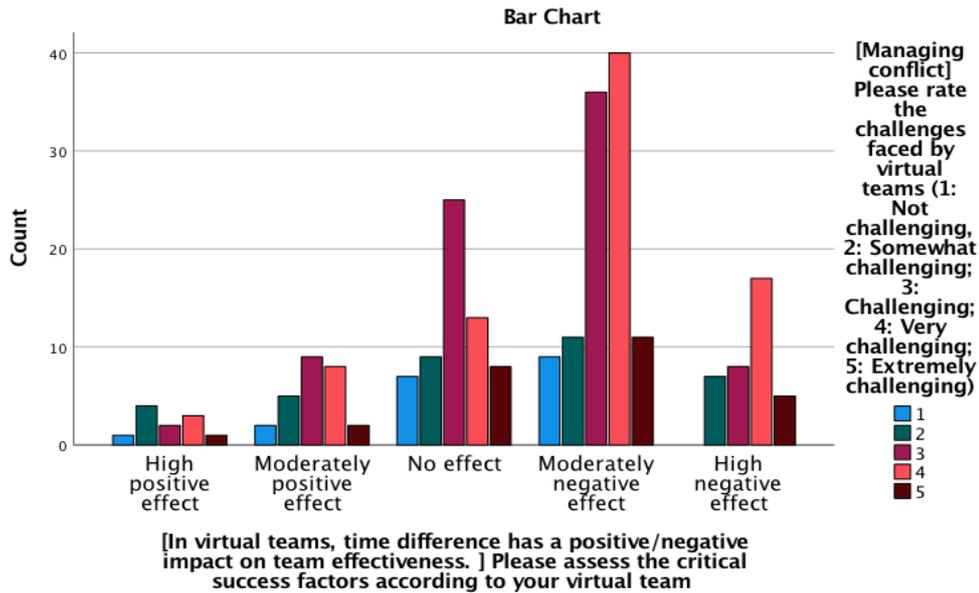


Relation between time difference managing team members' productivity

Managing conflict

To compare the relation between time difference and managing conflict, Chi-square test was conducted. Frequencies were not significantly different between time difference and managing conflict, $X^2(16, N = 243) = 18.912, p = .273$, and managing conflict, and managing conflict was found very challenging (49.4%).

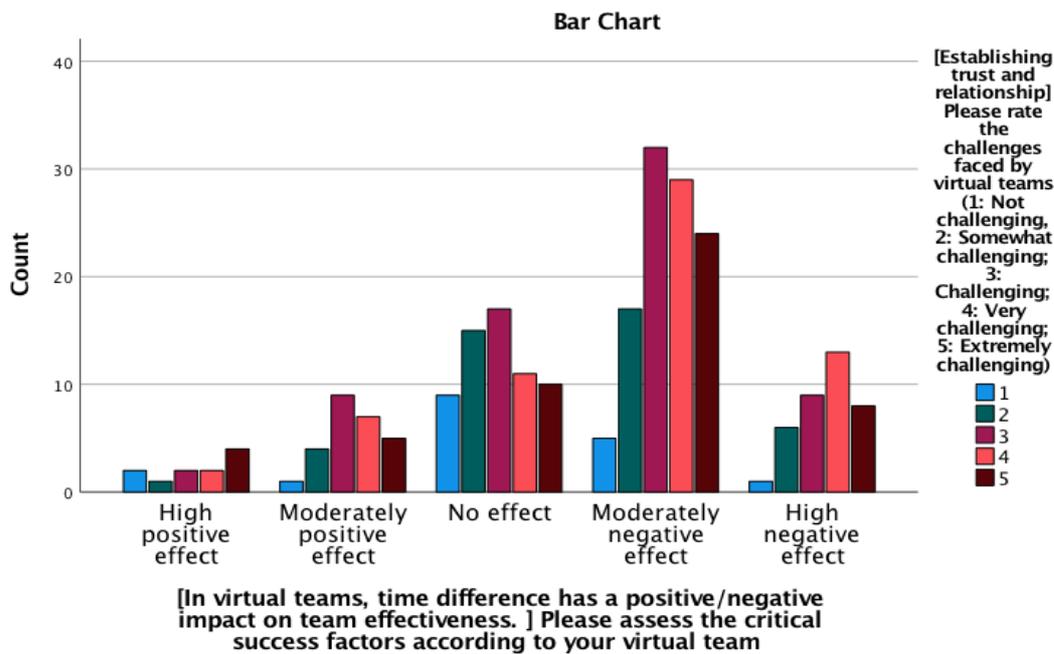
Appendix



Relation between time difference and managing conflict

Establishing trust and relationship

To compare the relation between time difference and establishing trust and relationship Chi-square test was conducted. There was no significant difference between time difference and establishing trust and relationship, $X^2(16, N = 243) = 17.183, p = .374$, suggesting that establishing trust and relationship can impact virtual team effectiveness since it was found challenging (46.4%).

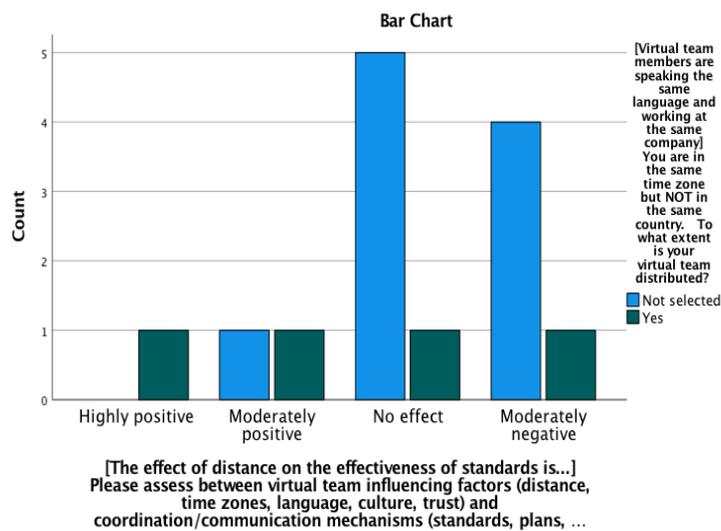


Relation between time difference and establishing trust and relationship

Appendix 32. H8 & You are in the same time zone but NOT in the same country

Virtual team members are speaking the same language and working at the same company

To compare the same language, same company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, same company cases and distance, $X^2(3, N = 14) = 3.547, p = .315$, virtual team members who are speaking the same language and working at the same company rated that distance has no effect on the effectiveness of standards.

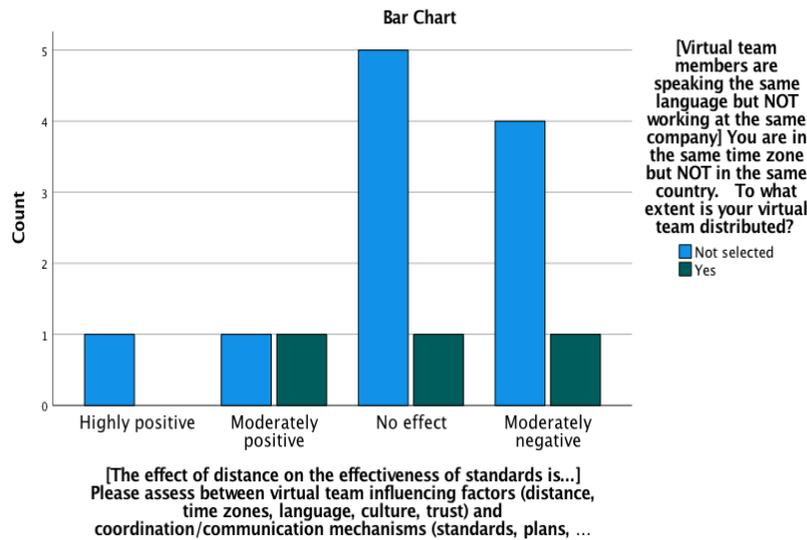


Relationship between same language, same company and effectiveness of standards

Virtual team members are speaking the same language but NOT working at the same company

To compare the same language, different company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, different company cases and distance, $X^2(3, N = 14) = 1.329, p = .722$, virtual team members who are speaking the same language and working at different company rated that distance has no effect on the effectiveness of standards.

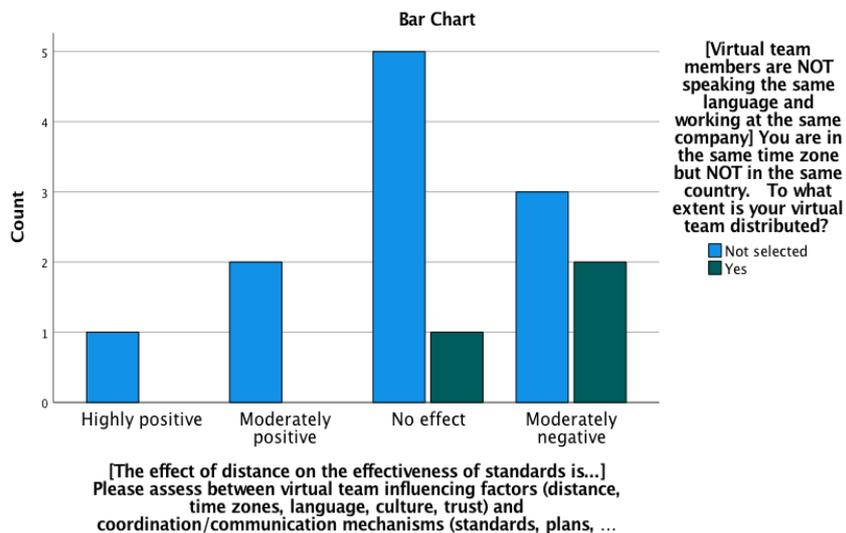
Appendix



Relationship between same language, different company and effectiveness of standards

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases and distance, Chi-square test was conducted. There was no significant difference between the different language, same company cases and distance, $X^2(3, N = 14) = 1.923, p = .588$, virtual team members who are speaking the different language and working at the same company rated that distance has no effect on the effectiveness of standards.

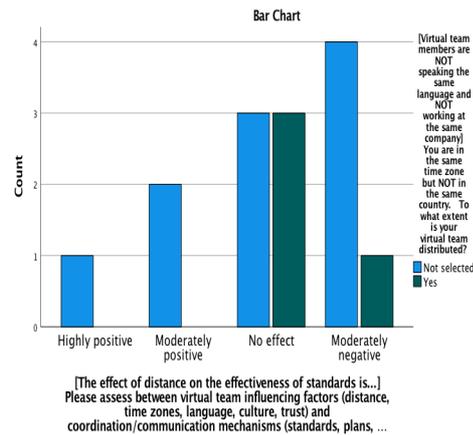


Relationship between different language, same company and effectiveness of standards

Appendix

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases and distance, Chi-square test was conducted. There was no significant difference between the different language, different company cases and distance, $X^2(3, N = 14) = 2.730, p = .435$, virtual team members who are speaking the different language and working at different company rated that distance has moderately negative effect on the effectiveness of standards.

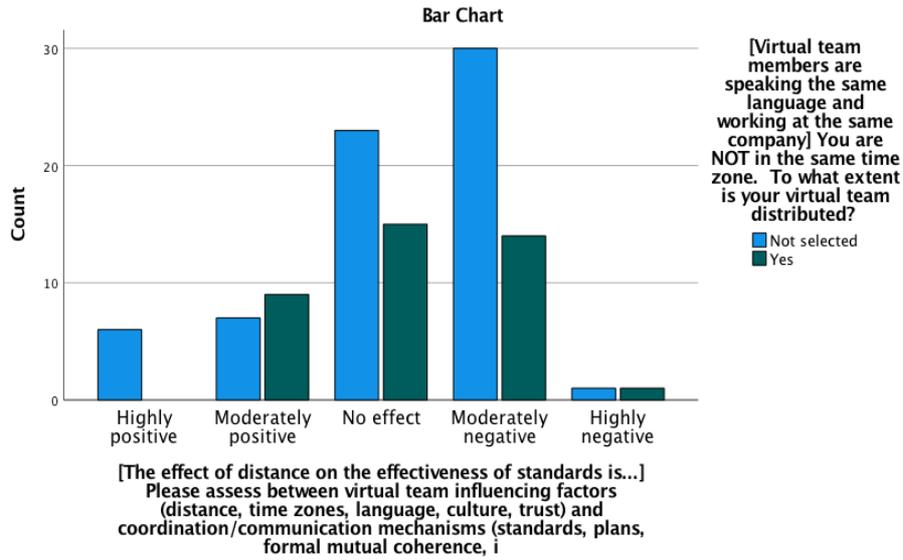


Relationship between different language, different company and effectiveness of standards

Appendix 33. H8 & You are NOT in the same time zone

Virtual team members are speaking the same language and working at the same company

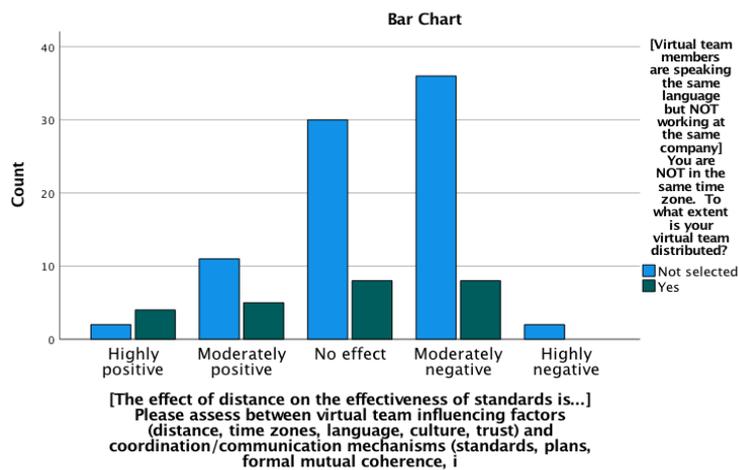
To compare the same language, same company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, same company cases and distance, $X^2(4, N = 106) = 6.833, p = .145$, virtual team members who are speaking the same language and working at the same company rated that distance has no effect on the effectiveness of standards.



Relationship between same language, same company and effectiveness of standards

Virtual team members are speaking the same language but NOT working at the same company

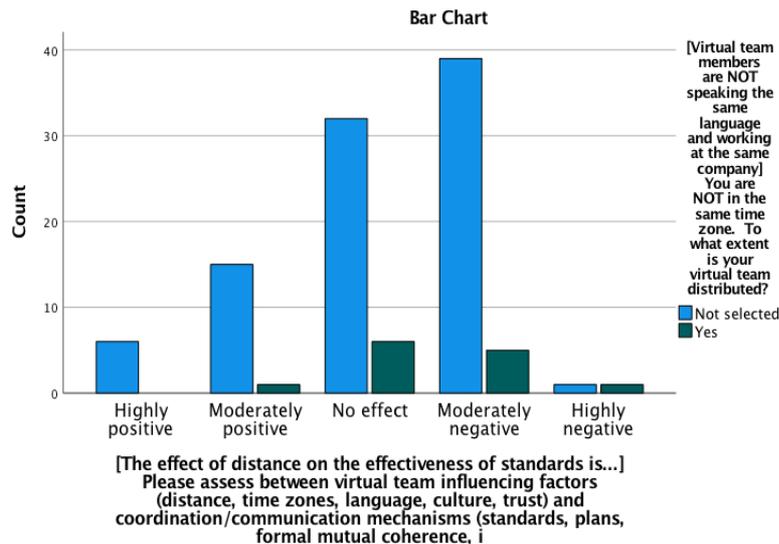
To compare the same language, different company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, different company cases and distance, $X^2(4, N = 106) = 8.166, p = .086$, virtual team members who are speaking the same language and working at different company rated that distance has a moderately negative effect on the effectiveness of standards.



Relationship between same language, different company and effectiveness of standards

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases and distance, Chi-square test was conducted. There was no significant difference between different language, same company cases and distance, $X^2(4, N = 106) = 4.495, p = .343$, virtual team members who are speaking different language and working at the same company rated that distance has no effect on the effectiveness of standards.

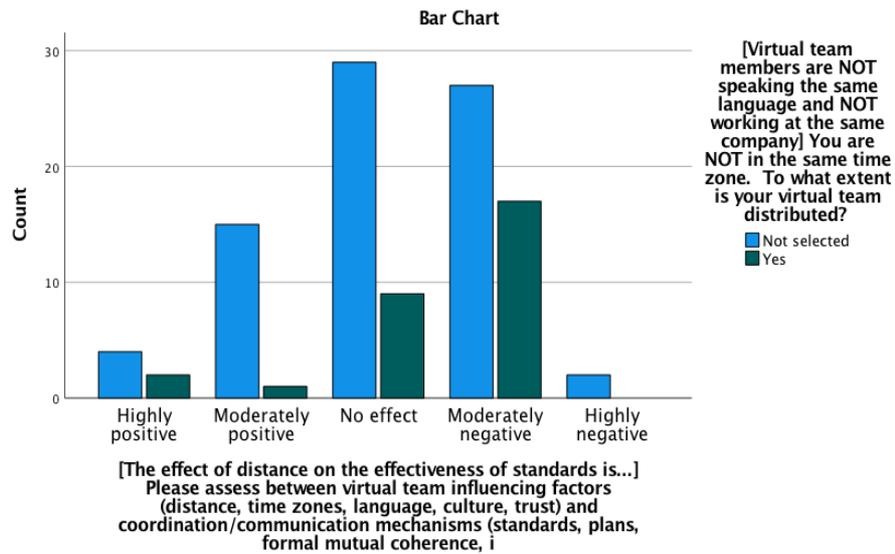


Relationship between different language, same company and effectiveness of standards

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases and distance, Chi-square test was conducted. There was no significant difference between different language, different company cases and distance, $X^2(4, N = 106) = 7.522, p = .111$, virtual team members who are speaking different language and working at different company rated that distance has a moderately negative effect on the effectiveness of standards.

Appendix

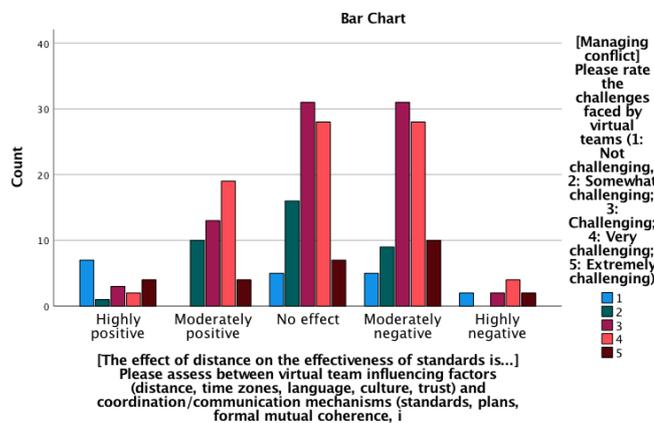


Relationship between different language, different company and effectiveness of standards

Appendix 34. Comparing the Challenges with Hypothesis 8

Managing conflict

To compare the relation between distance and managing conflict, Chi-square test was conducted. Frequencies were significantly different between distance and managing conflict, $X^2(16, N = 243) = 46.266, p = .000$, and managing conflict was found challenging (38.8%).

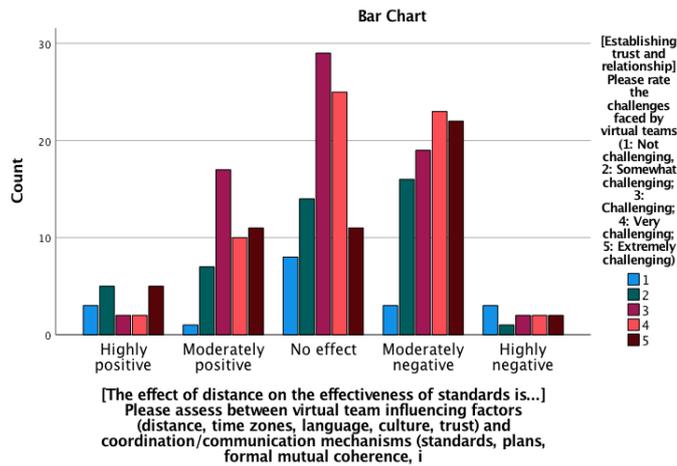


Relation between distance and managing conflict

Establishing trust and relationship

To compare the relation between establishing trust and relationship and distance, Chi-square test was conducted. Frequencies were significantly different between establishing trust and relationship and distance, $X^2(16, N = 243) = 26.770, p = .044$, and establishing trust and relationship was found challenging (42.0%).

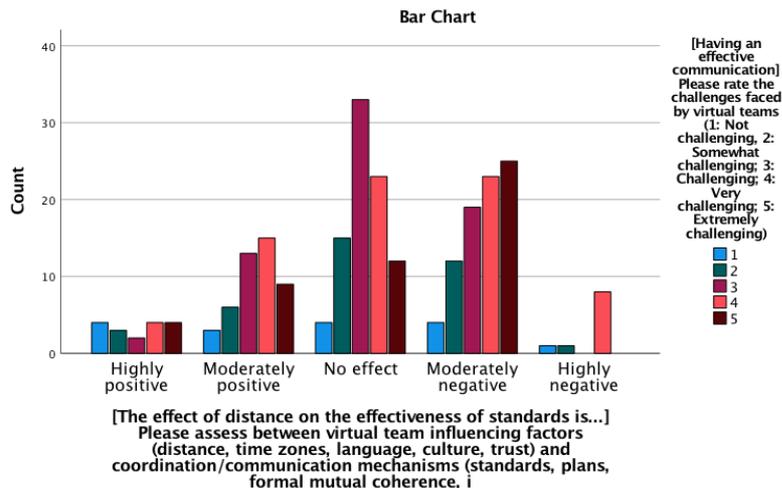
Appendix



Relation between distance and establishing trust and relationship

Having an effective communication

To compare the relation between distance and effective communication, Chi-square test was conducted. Frequencies were significantly different between distance and effective communication, $X^2(16, N = 243) = 34.457, p = .005$, and having an effective communication was found challenging (49.3%).

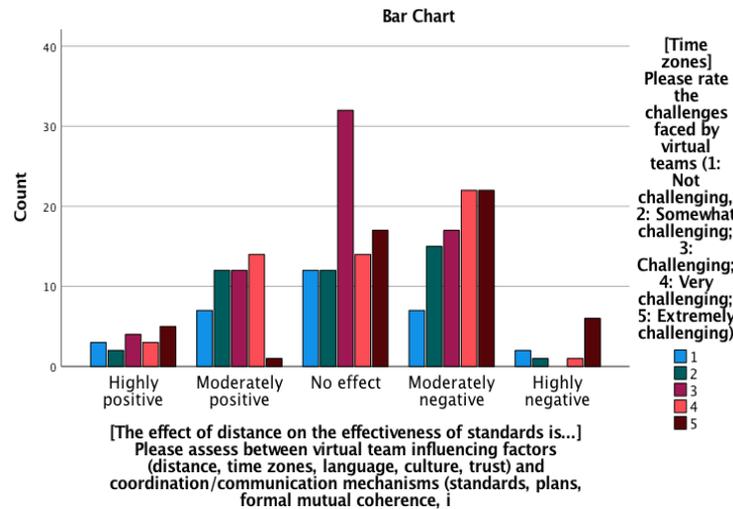


Relation between distance and effective communication

Time zones

To compare the relation between distance and time zones, Chi-square test was conducted. Frequencies were significantly different between distance and time zones, $X^2(16, N = 243) = 34.051, p = .044$, and time zones were found challenging (49.2%).

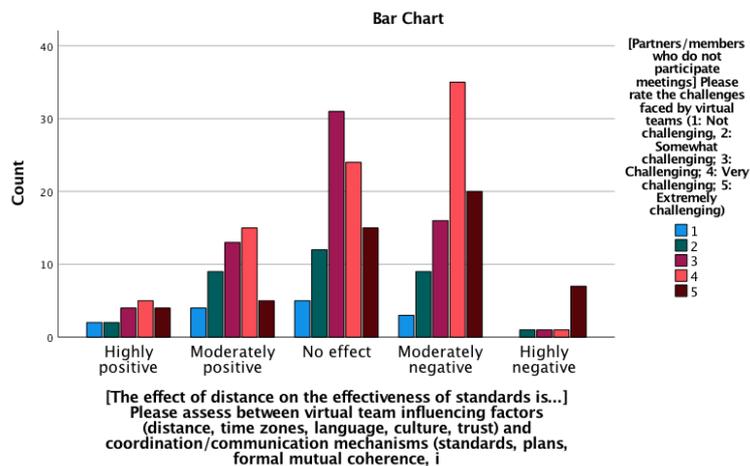
Appendix



Relation between distance and time zones

Partners/members who do not participate meetings

To compare the relation between distance and partners/members who do not participate meetings, Chi-square test was conducted. Frequencies were significantly different between distance and partners/members who do not participate meetings, $X^2(16, N = 243) = 29.528$, $p = .021$, and partners/members who do not participate meetings was found very challenging (43.8%).

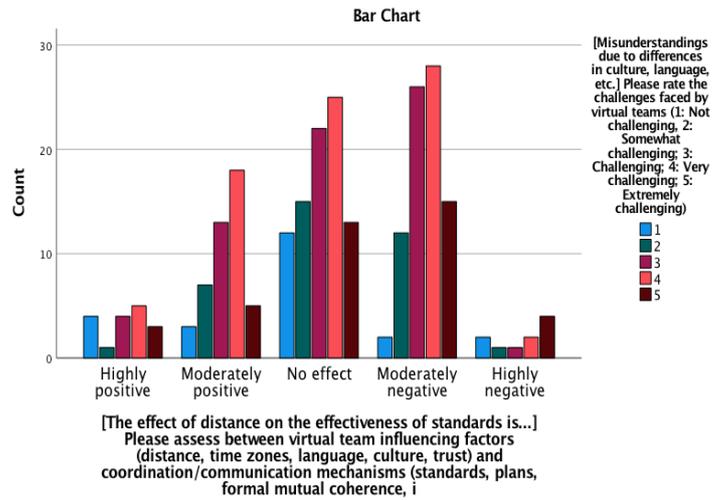


Relation between distance and partners/members who do not participate meetings

Misunderstandings due to differences in culture, language

To compare the relation between distance and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between distance and misunderstandings due to differences, $X^2(16, N = 243) = 20.579$, $p = .195$, and misunderstandings due to differences was found very challenging (35.9%).

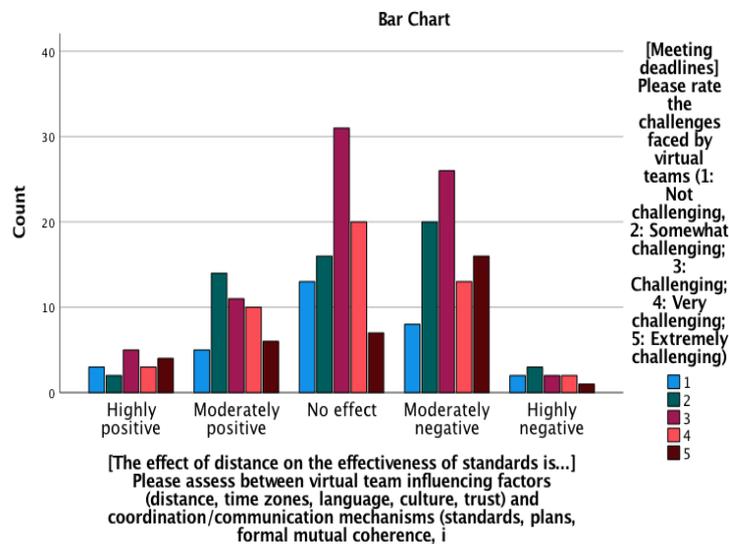
Appendix



Relation between distance and misunderstandings

Meeting deadlines

To compare the relation between distance and meeting deadlines, Chi-square test was conducted. Frequencies were not significantly different between distance and meeting deadlines, $X^2(16, N = 243) = 13.110$, $p = .665$, and meeting deadlines was found challenging (41.3%).

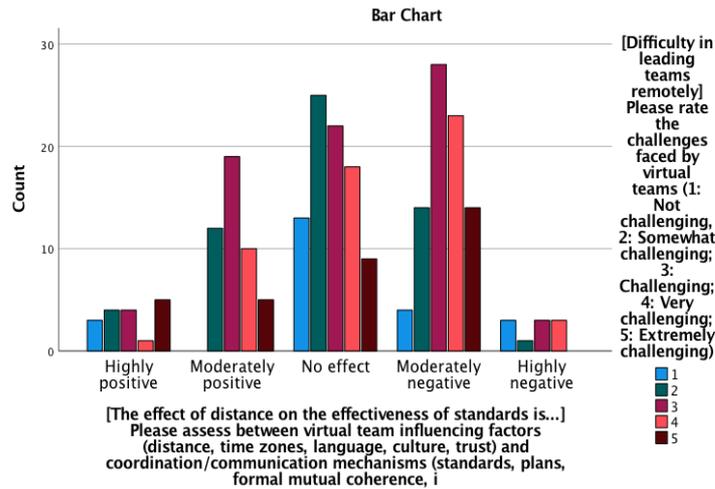


Relation between distance and meeting deadlines

Difficulty in leading teams remotely

To compare the relation between distance and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were significantly different between distance and difficulty in leading teams remotely, $X^2(16, N = 243) = 30.682$, $p = .015$, and difficulty in leading teams remotely was found challenging (36.8%).

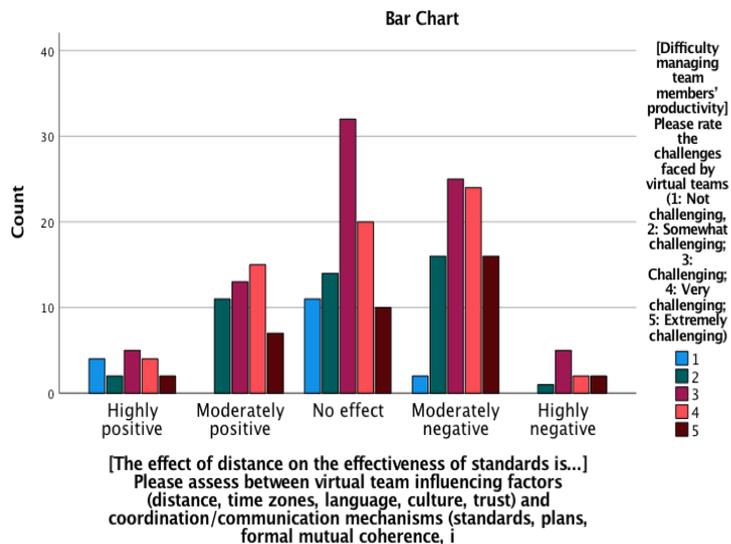
Appendix



Relation between distance and leading teams remotely

Difficulty managing team members' productivity

To compare the relation between distance and difficulty managing team members' productivity, Chi-square test was conducted. Frequencies were not significantly different between distance and difficulty managing team members' productivity, $X^2(16, N = 243) = 24.128, p = .087$, and difficulty managing team members' productivity was found challenging (40.0%).



Relation between distance and managing team members' productivity

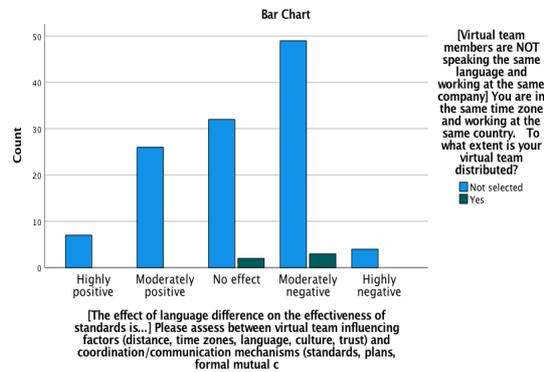
Appendix 35. H9 & You are in the same time zone and working at the same country

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases and language difference, Chi-square test was conducted. There was no significant difference between the different language, same

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company cases and language difference, $X^2(4, N = 123) = 2.243, p = .691$, virtual team members who are speaking the different language and working at the same company rated that language difference has moderately negative effect on the effectiveness of standards.

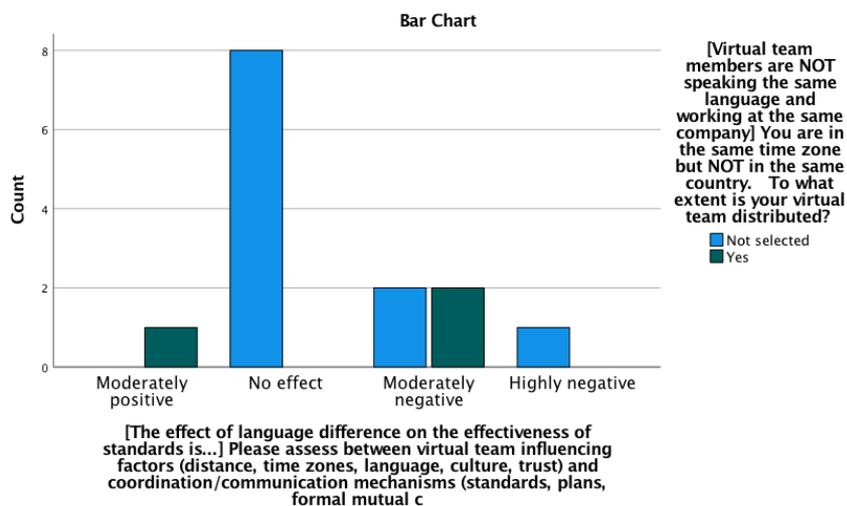


Relationship between different language, same company and effectiveness of standards

Appendix 36. H9 & You are in the same time zone but NOT in the same country

Virtual team members are NOT speaking the same language and working at the same company

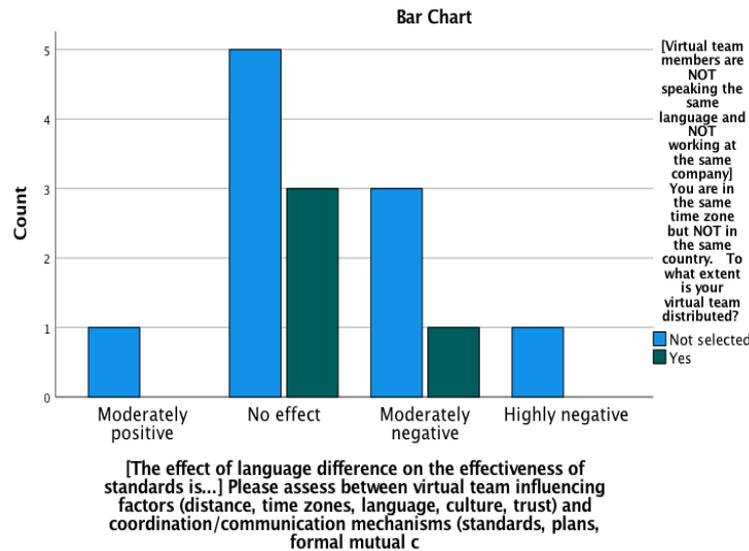
To compare the different language, same company cases and language difference, Chi-square test was conducted. There was a significant difference between the different language, same company cases and language difference, $X^2(3, N = 14) = 8.061, p = .045$, virtual team members who are speaking the different language and working at the same company rated that language difference has moderately negative effect on the effectiveness of standards.



Relationship between different language, same company and effectiveness of standards

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases and language difference, Chi-square test was conducted. There was not a significant difference between the different language, different company cases and language difference, $X^2(3, N = 14) = 1.138, p = .768$, virtual team members who are speaking the different language and working at different company rated that language difference has no effect on the effectiveness of standards.

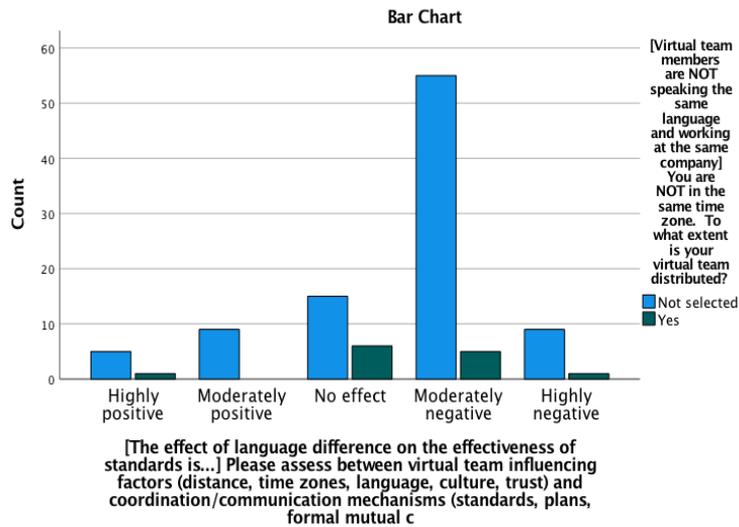


Relationship between different language, different company and effectiveness of standards

Appendix 37. H9 & You are NOT in the same time zone

Virtual team members are NOT speaking the same language and working at the same company

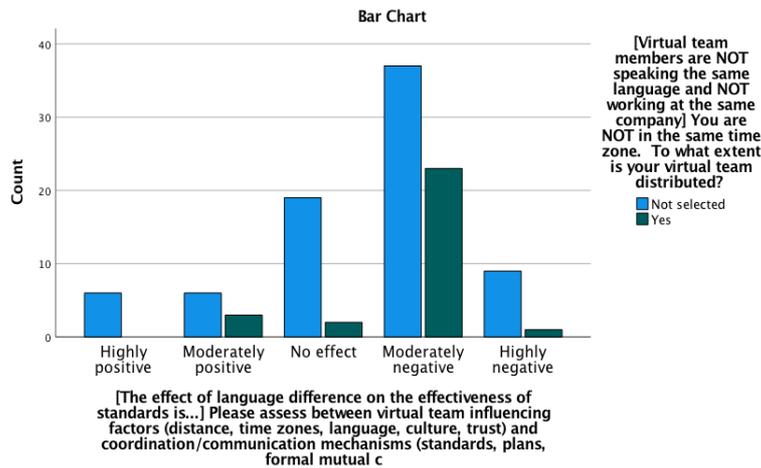
To compare the different language, same company cases and language difference, Chi-square test was conducted. There was not a significant difference between the different language, same company cases and language difference, $X^2(4, N = 106) = 7.465, p = .113$, virtual team members who are speaking different language and working at the same company rated that language difference has no effect on the effectiveness of standards.



Relationship between different language, same company and effectiveness of standards

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases and language difference, Chi-square test was conducted. There was a significant difference between the different language, different company cases and language difference, $X^2(4, N = 106) = 10.935, p = .027$, virtual team members who are speaking different language and working at different company rated that language difference has a moderately negative effect on the effectiveness of standards.

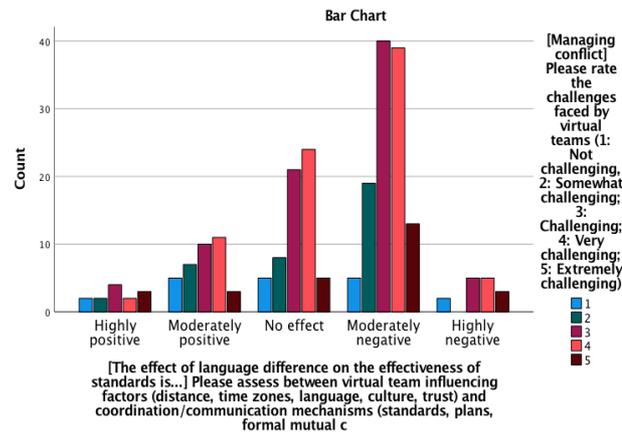


Relationship between different language, different company and effectiveness of standards

Appendix 38. Comparing the Challenges with Hypothesis 9

Managing conflict

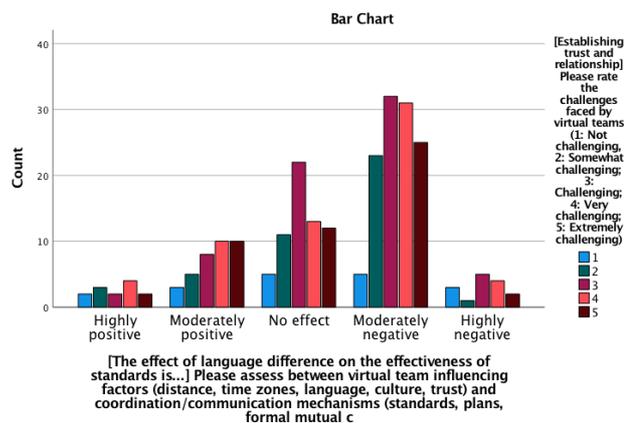
To compare the relation between language difference and managing conflict, Chi-square test was conducted. Frequencies were not significantly different between language difference and managing conflict, $X^2(16, N = 243) = 13.920, p = .605$, and managing conflict was found challenging (50.0%).



Relation between language difference and managing conflict

Establishing trust and relationship

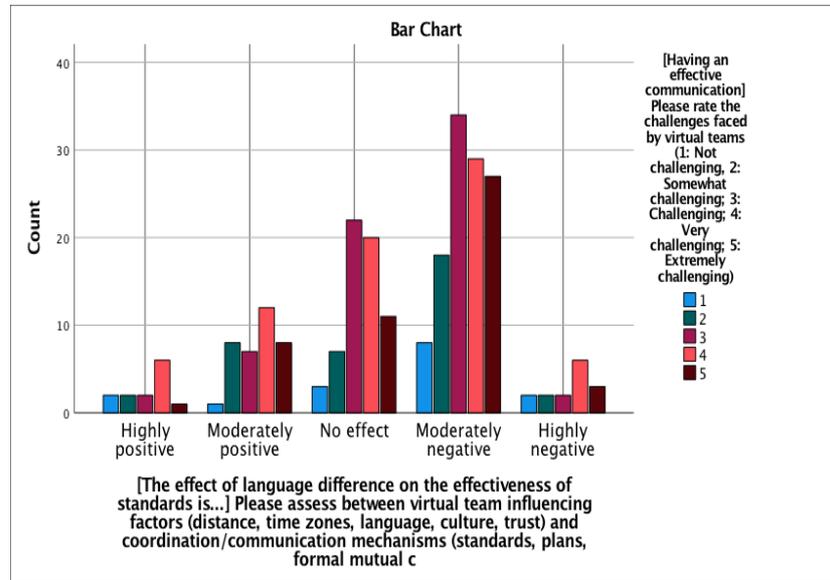
To compare the relation between language difference and establishing trust and relationship, Chi-square test was conducted. Frequencies were not significantly different between language difference and establishing trust and relationship, $X^2(16, N = 243) = 12.502, p = .709$, and establishing trust and relationship was found challenging (46.4%).



Relation between language difference and establishing trust and relationship

Having an effective communication

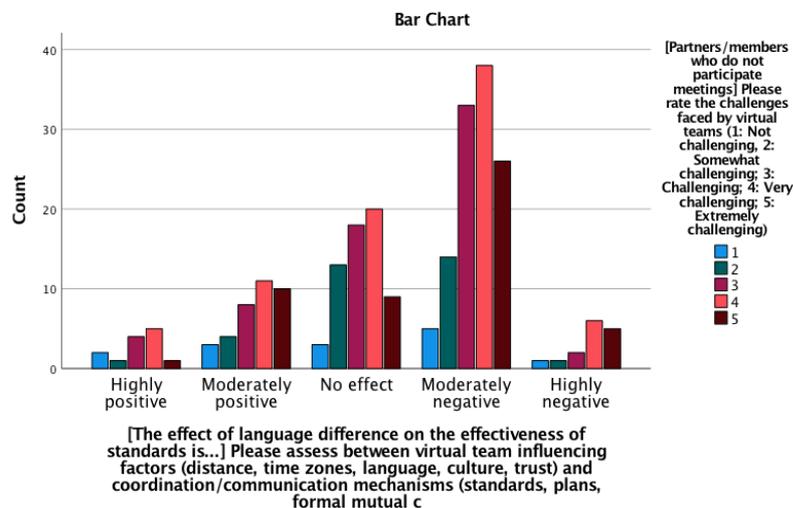
To compare the relation between language difference and having an effective communication, Chi-square test was conducted. Frequencies were not significantly different between language difference and having an effective communication, $X^2(16, N = 243) = 14.218, p = .582$, and having an effective communication was found challenging (50.7%).



Relation between language difference and effective communication

Partners/members who do not participate meetings

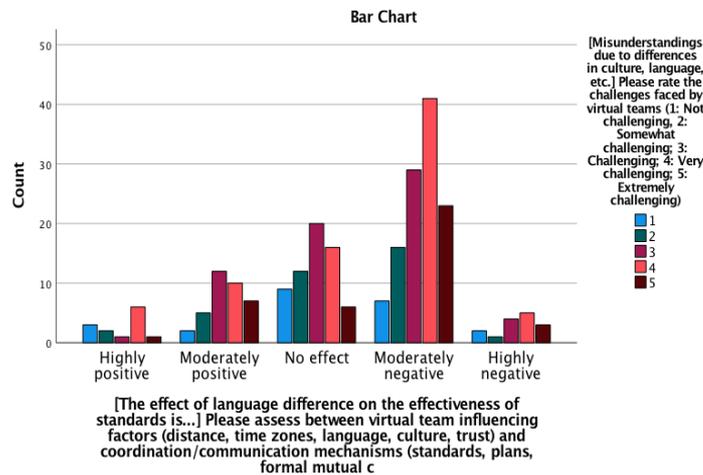
To compare the relation between language difference and partners/members who do not participate meetings, Chi-square test was conducted. Frequencies were not significantly different between language difference and partners/members who do not participate meetings, $X^2(16, N = 243) = 13.024, p = .671$, and partners/members who do not participate meetings was very found challenging (47.5%).



Relation between language difference and partners/members who do not participate meetings

Misunderstandings due to differences in culture, language

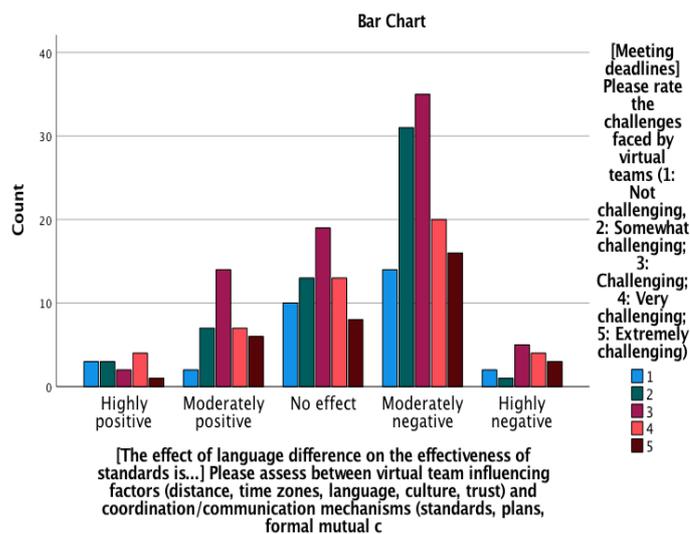
To compare the relation between language difference and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between language difference and misunderstandings due to differences, $X^2(16, N = 243) = 16.735, p = .403$, and misunderstandings due to differences was found very challenging (52.6%).



Relation between language difference and misunderstandings

Meeting deadlines

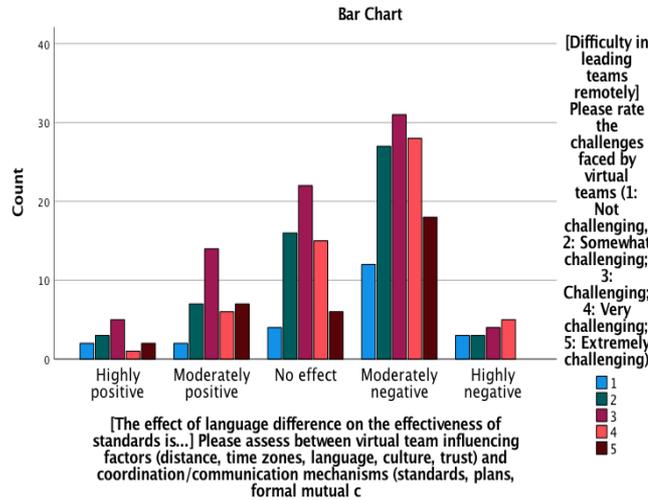
To compare the relation between language difference and meeting deadlines, Chi-square test was conducted. Frequencies were not significantly different between language difference and meeting deadlines, $X^2(16, N = 243) = 10.292, p = .851$, and meeting deadlines was found challenging (46.7%).



Relation between language difference and meeting deadlines

Difficulty in leading teams remotely

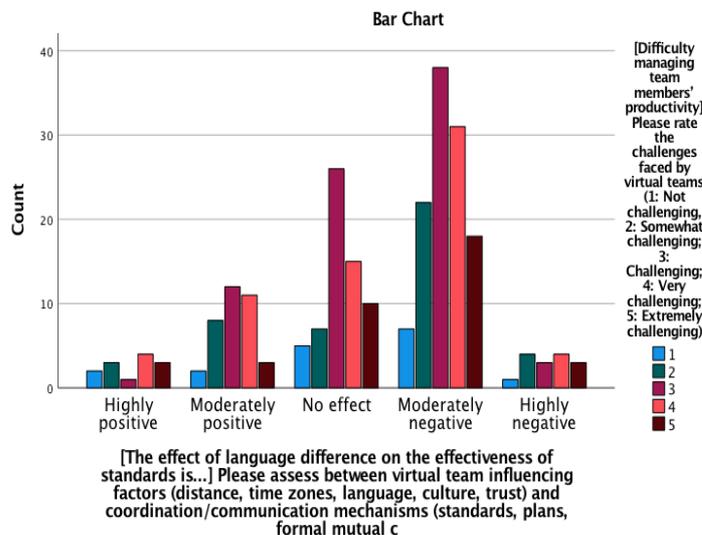
To compare the relation between language difference and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were not significantly different between language difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 12.824, p = .686$, and difficulty in leading teams remotely was found challenging (40.8%).



Relation between language difference and leading teams remotely

Difficulty managing team members' productivity

To compare the relation between language difference and difficulty managing team members' productivity, Chi-square test was conducted. Frequencies were not significantly different between language difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 11.506, p = .777$, and difficulty managing team members' productivity was found challenging (47.5%).

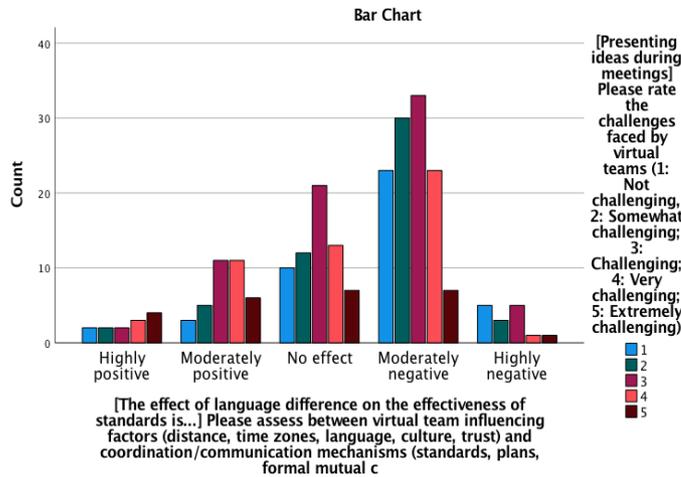


Relation between language difference and managing team members' productivity

Appendix

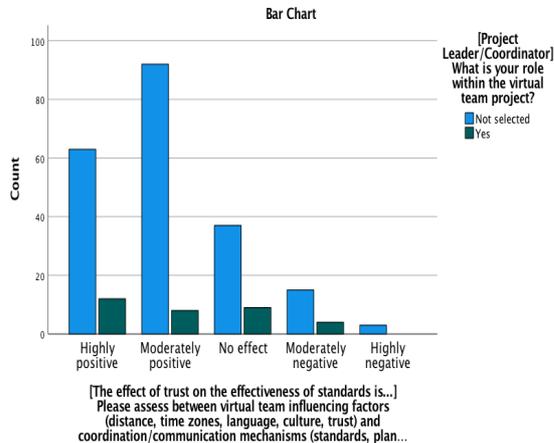
Presenting ideas during meetings

To compare the relation between language difference and presenting ideas during meetings, Chi-square test was conducted. Frequencies were not significantly different between language difference and presenting ideas during meetings, $X^2(16, N = 243) = 20.191, p = .212$, and presenting ideas during meetings was found challenging (45.8%).

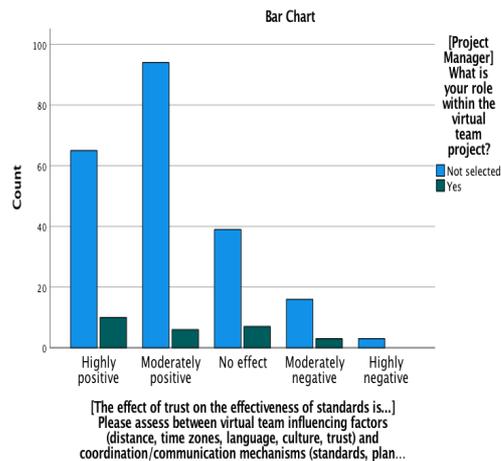


Relation between language difference and presenting ideas

Appendix 39. Hypothesis 10 and Role Comparison

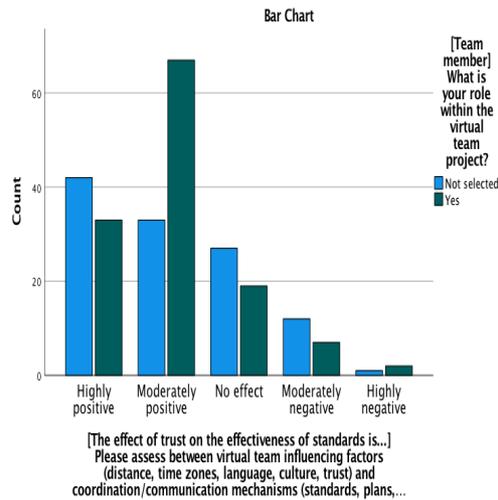


Project Leader/Coordinator

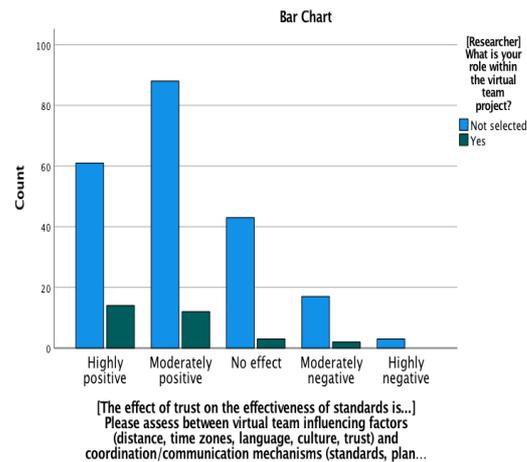


Project Manager

Appendix



Team Member

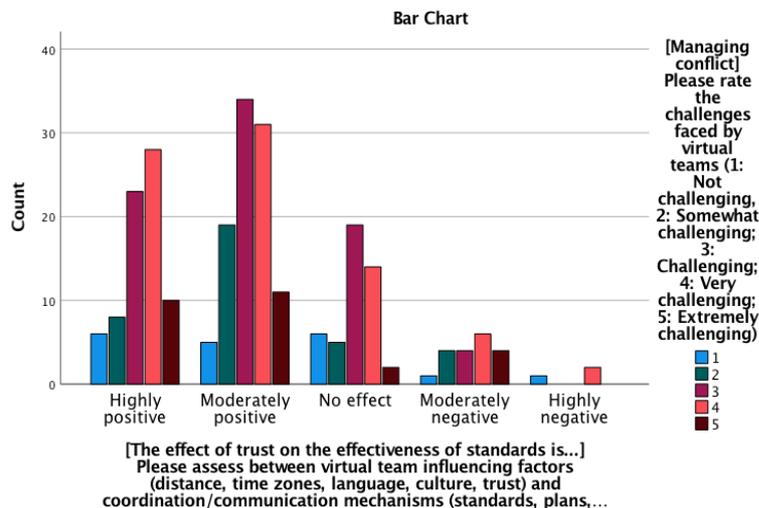


Researcher

Appendix 40. Comparing the Challenges with Hypothesis 10

Managing conflict

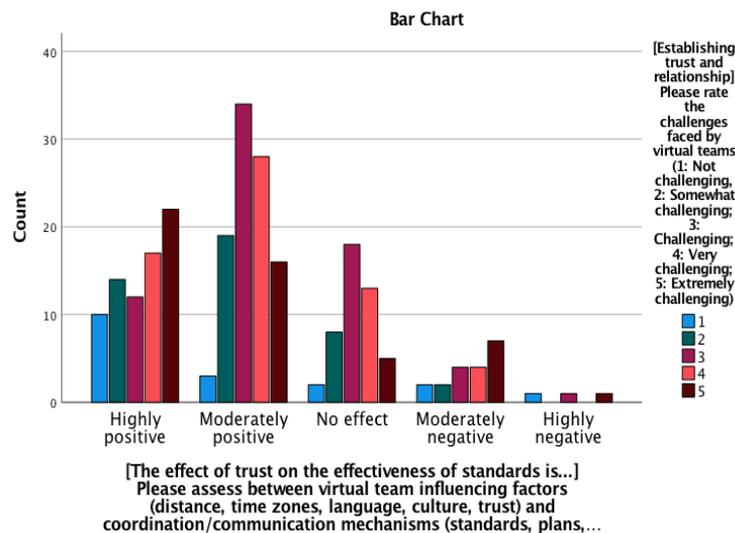
To compare the relation between trust and managing conflict, Chi-square test was conducted. Frequencies were not significantly different between trust and managing conflict, $X^2(16, N = 243) = 17.604, p = .348$, and managing conflict was found challenging (42.5%).



Relation between trust and managing conflict

Establishing trust and relationship

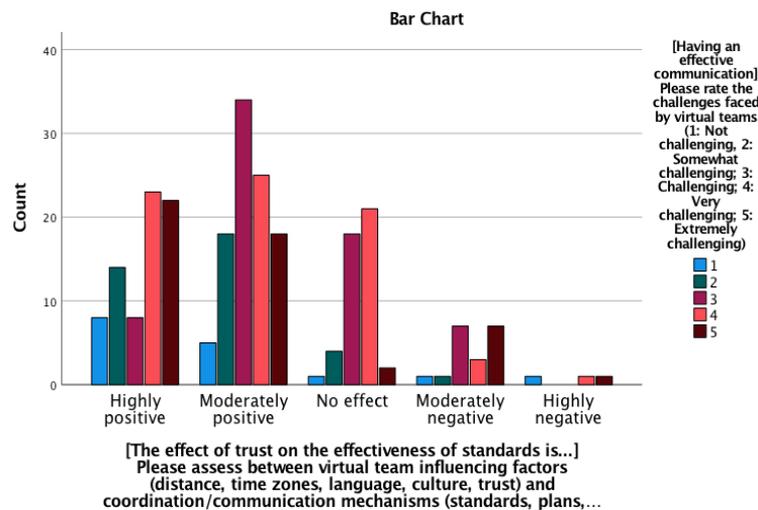
Frequencies were significantly different between trust and establishing trust and relationship, $X^2(16, N = 243) = 28.312, p = .029$, and establishing trust and relationship was found challenging (49.3%).



Relation between trust and establishing trust and relationship

Having an effective communication

Frequencies were significantly different between trust and having an effective communication, $X^2(16, N = 243) = 41.511, p = .000$, and having an effective communication was found challenging (50.7%).

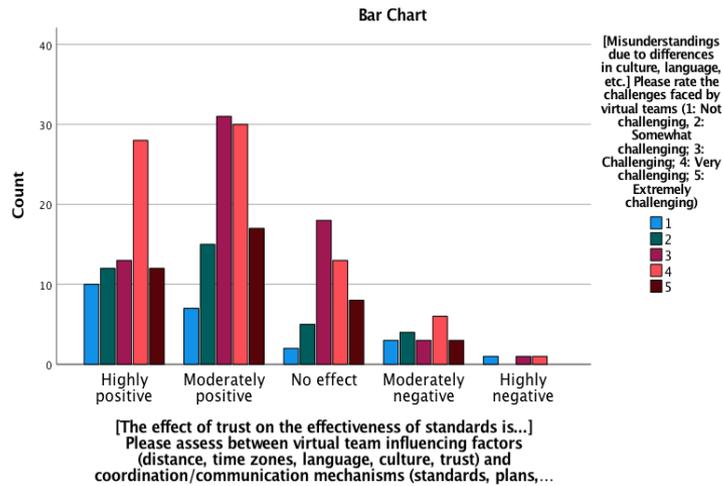


Relation between trust and communication

Misunderstandings due to differences in culture, language

To compare the relation between trust and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between trust and misunderstandings due to differences, $X^2(16, N = 243) = 15.334, p = .500$, and misunderstandings due to differences was found challenging (47.0%).

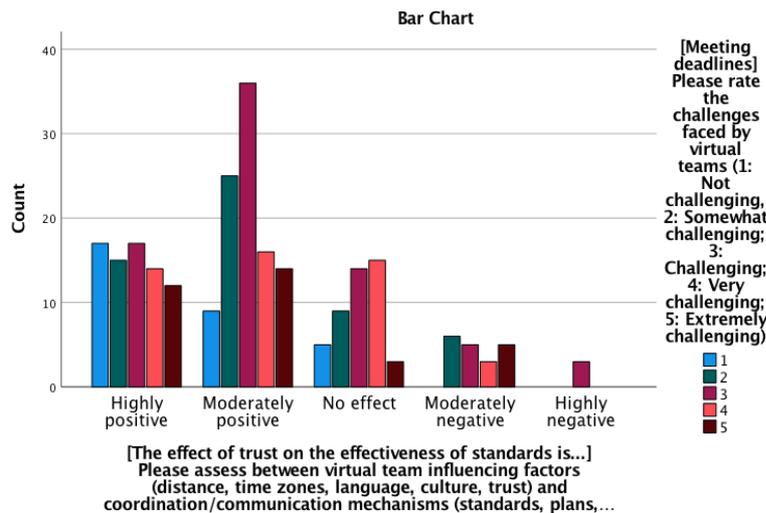
Appendix



Relation between trust and misunderstandings

Meeting deadlines

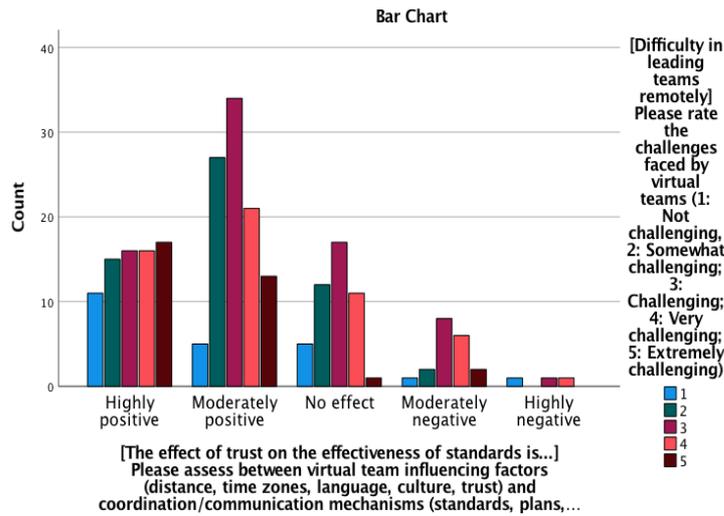
Frequencies were significantly different between trust and meeting deadlines, $X^2(16, N = 243) = 28.981, p = .024$, and meeting deadlines was found challenging (48.0%).



Relation between trust and meeting deadlines

Difficulty in leading teams remotely

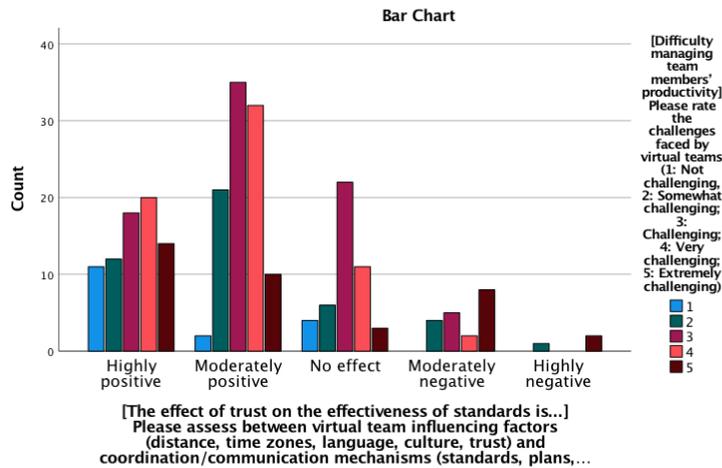
To compare the relation between trust and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were not significantly different between trust and difficulty in leading teams remotely, $X^2(16, N = 243) = 24.014, p = .089$, and difficulty in leading teams remotely was found challenging (44.7%).



Relation between trust and leading teams remotely

Difficulty managing team members’ productivity

To compare the relation between trust and difficulty managing team members’ productivity, Chi-square test was conducted. Frequencies were significantly different between trust and difficulty managing team members’ productivity, $X^2(16, N = 243) = 42.401, p = .000$, and difficulty managing team members’ productivity was found challenging (43.8%).

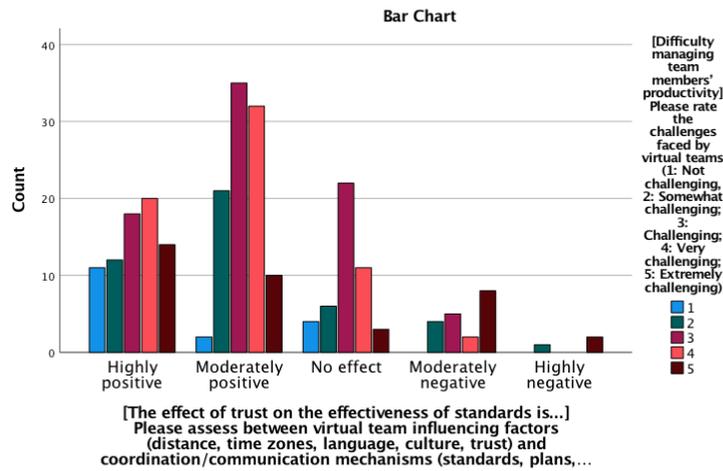


Relation between trust and managing team members’ productivity

Difficulty managing team members’ productivity

Frequencies were significantly different between trust and difficulty managing team members’ productivity, $X^2(16, N = 243) = 42.401, p = .000$, and difficulty managing team members’ productivity was found challenging (43.8%).

Appendix

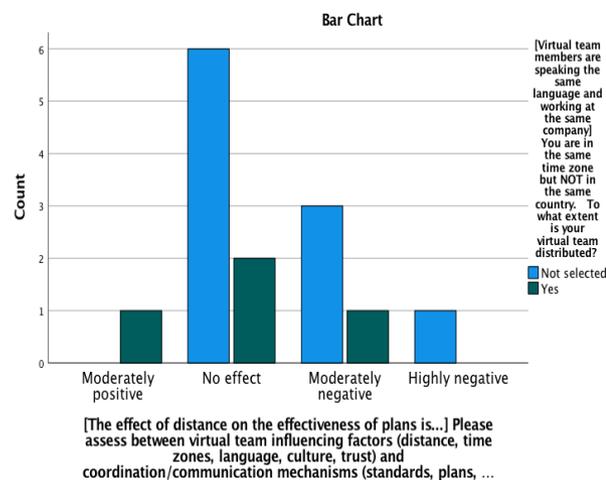


Relation between trust and managing team members' productivity

Appendix 41. H11 & You are in the same time zone but NOT in the same country

Virtual team members are speaking the same language and working at the same company

To compare the same language, same company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, same company cases and distance, $X^2(3, N = 14) = 2.975, p = .395$, virtual team members who are speaking the same language and working at the same company rated that distance has no effect on the effectiveness of plans.



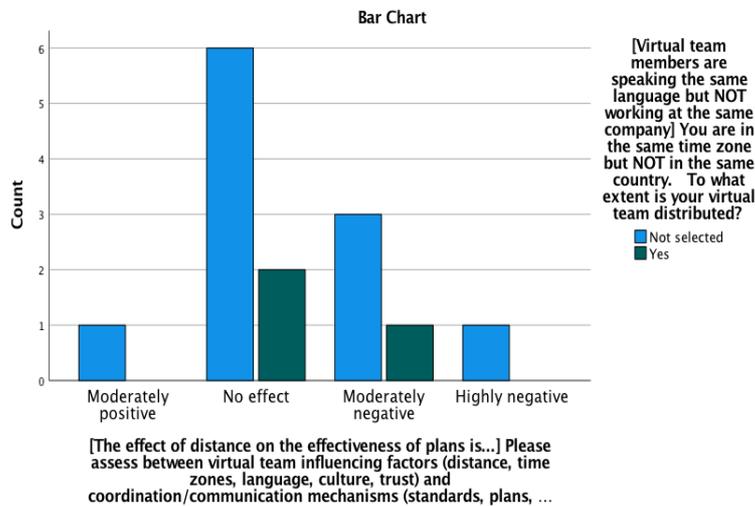
Relationship between same language, same company and effectiveness of plans

Virtual team members are speaking the same language but NOT working at the same company

To compare the same language, different company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, different company cases and distance, $X^2(3, N = 14) = 0.636, p = .888$, virtual team members who are speaking

Appendix

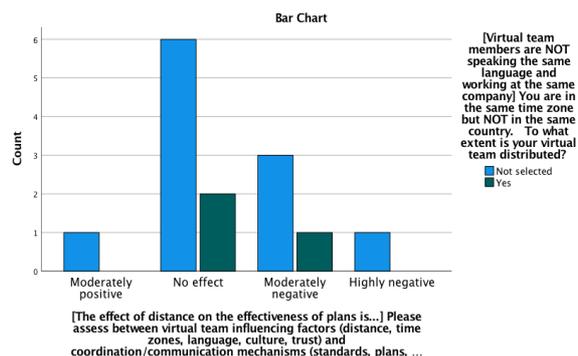
the same language and working at different company rated that distance has no effect on the effectiveness of plans.



Relationship between same language, different company and effectiveness of plans

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases and distance, Chi-square test was conducted. There was no significant difference between the different language, same company cases and distance, $X^2(3, N = 14) = 0.636, p = .888$, virtual team members who are speaking the different language and working at the same company rated that distance has no effect on the effectiveness of plans.



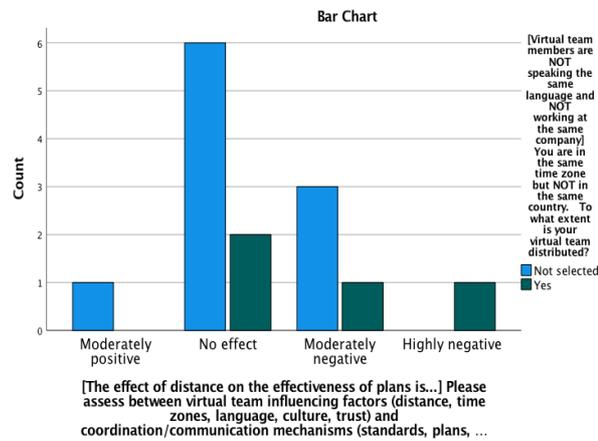
Relationship between different language, same company and effectiveness of plans

Virtual team members are NOT speaking the same language and NOT working at the same company

Distance has a moderately negative effect on the effectiveness of plans. To compare the different language, different company cases and distance, Chi-square test was conducted. There was no significant difference between the different language, different company cases and

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distance, $X^2(3, N = 14) = 2.975, p = .395$, virtual team members who are speaking the different language and working at different company rated that distance has no effect on the effectiveness of plans.

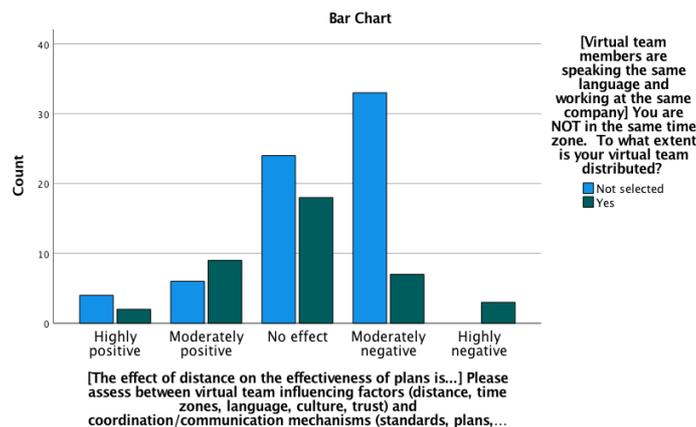


Relationship between different language, different company and effectiveness of plans

Appendix 42. H11 & You are NOT in the same time zone

Virtual team members are speaking the same language and working at the same company

To compare the same language, same company cases and distance, Chi-square test was conducted. There was a significant difference between the same language, same company cases and distance, $X^2(4, N = 106) = 15.725, p = .003$, virtual team members who are speaking the same language and working at the same company rated that distance has no effect on the effectiveness of plans.



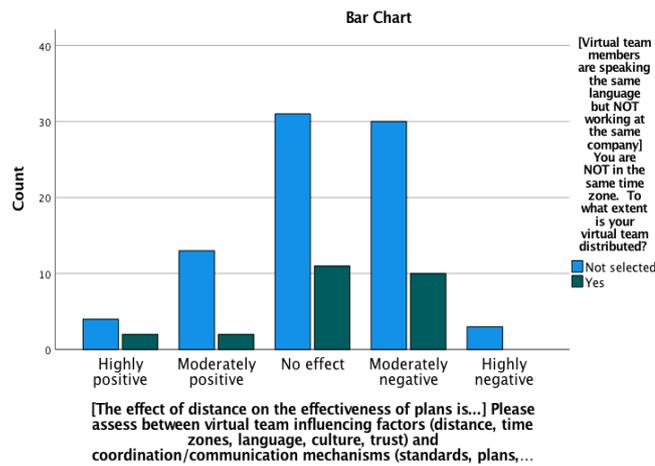
Relationship between same language, same company and effectiveness of plans

Virtual team members are speaking the same language but NOT working at the same company

To compare the same language, different company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, different company

Appendix

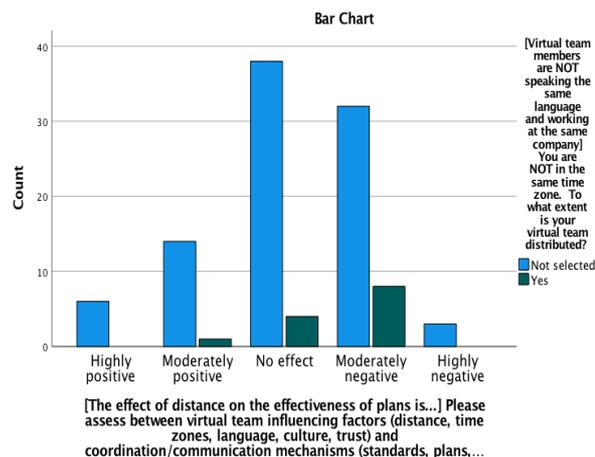
cases and distance, $X^2(4, N = 106) = 2.320, p = .677$, virtual team members who are speaking the same language and working at different company rated that distance has no effect on the effectiveness of plans.



Relationship between same language, different company and effectiveness of plans

Virtual team members are NOT speaking the same language and working at the same company

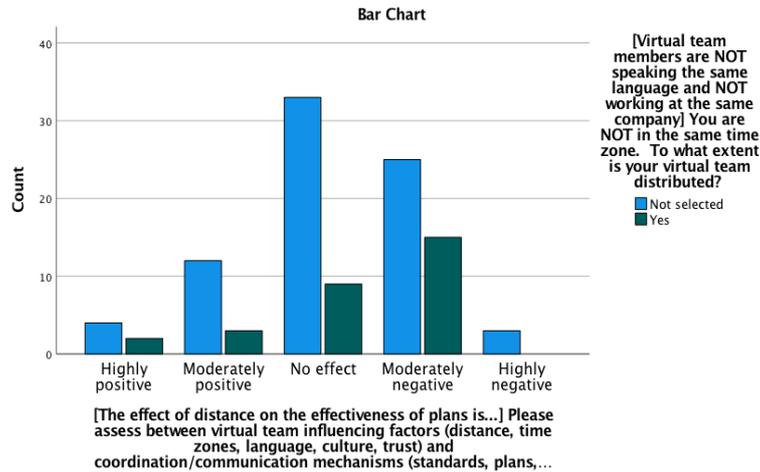
To compare the different language, same company cases and distance, Chi-square test was conducted. There was no significant difference between the different language, same company cases and distance, $X^2(4, N = 106) = 4.213, p = .378$, virtual team members who are speaking the different language and working at the same company rated that distance has a moderately negative effect on the effectiveness of plans.



Relationship between different language, same company and effectiveness of plans

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases and distance, Chi-square test was conducted. There was no significant difference between the different language, different company cases and distance, $X^2(4, N = 106) = 4.460, p = .347$, virtual team members who are speaking the different language and working at different company rated that distance has a moderately negative effect on the effectiveness of plans.

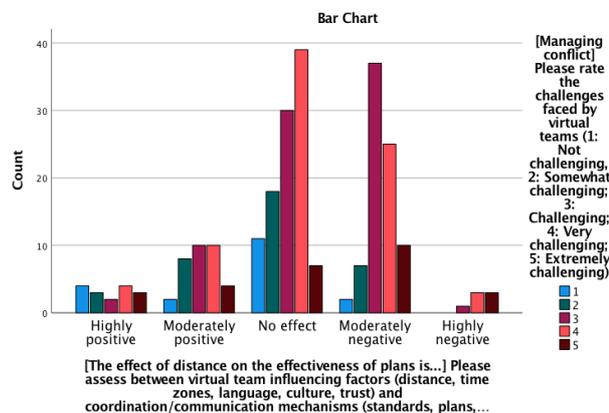


Relationship between different language, different company and effectiveness of plans

Appendix 43. Comparing the Challenges with Hypothesis 11

Managing conflict

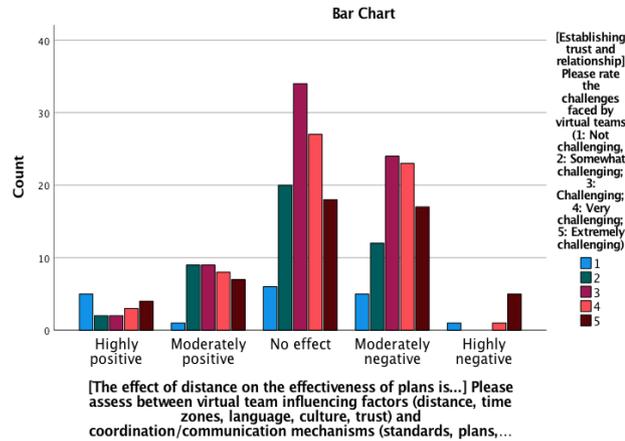
Frequencies were significantly different between distance and managing conflict, $X^2(16, N = 243) = 34.045, p = .005$, and managing conflict was found very challenging.



Relation between distance and managing conflict

Establishing trust and relationship

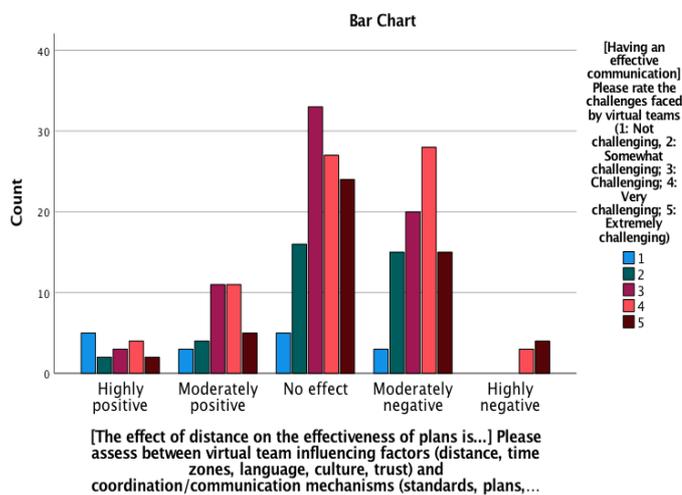
Frequencies were significantly different between distance and establishing trust and relationship, $X^2(16, N = 243) = 32.053, p = .010$, and establishing trust and relationship was found challenging.



Relation between distance and establishing trust and relationship

Having an effective communication

Frequencies were significantly different between distance and having an effective communication, $X^2(16, N = 243) = 30.359, p = .016$, and having an effective communication was found challenging.

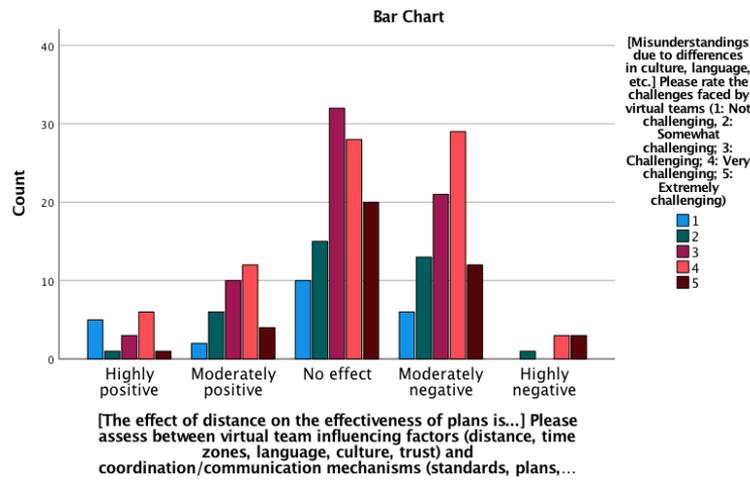


Relation between distance and effective communication

Misunderstandings due to differences in culture, language

Frequencies were not significantly different between distance and misunderstandings due to differences, $X^2(16, N = 243) = 20.251, p = .209$, and misunderstandings due to differences were found challenging.

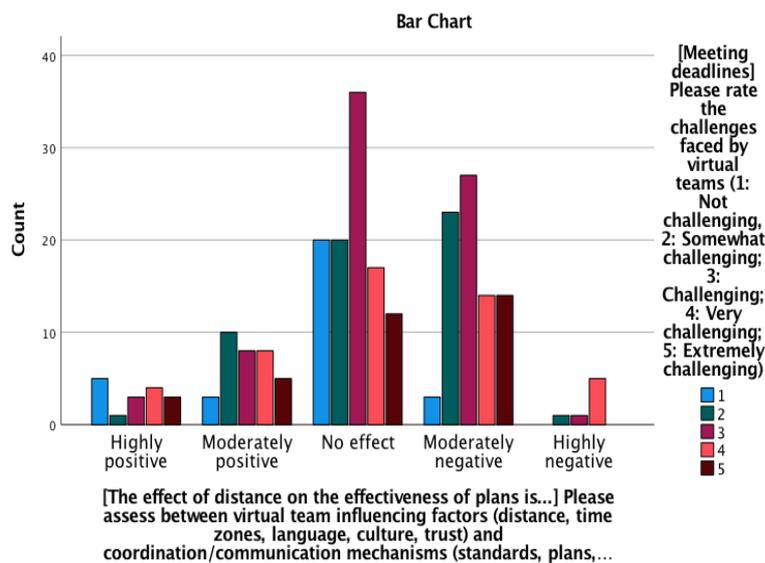
Appendix



Relation between distance and misunderstandings

Meeting deadlines

Frequencies were significantly different between distance and meeting deadlines, $X^2(16, N = 243) = 34.406, p = .005$, and meeting deadlines was found challenging.

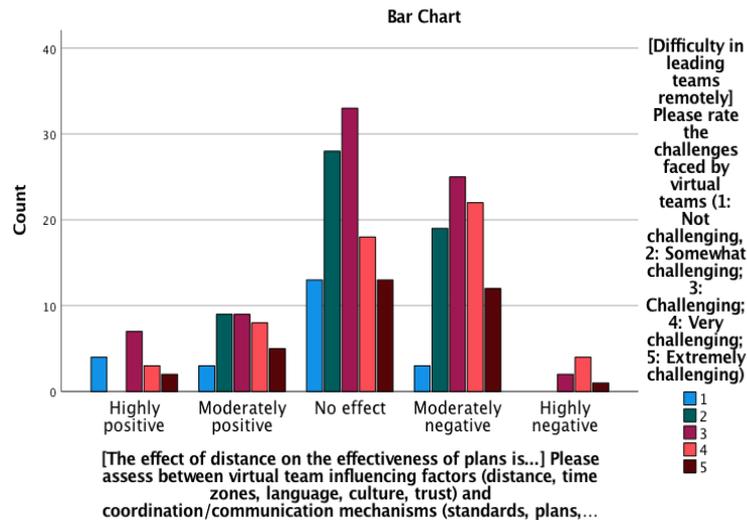


Relation between distance and meeting deadlines

Difficulty in leading teams remotely

Frequencies were not significantly different between distance and difficulty in leading teams remotely, $X^2(16, N = 243) = 21.870, p = .147$, and difficulty in leading teams remotely was found challenging.

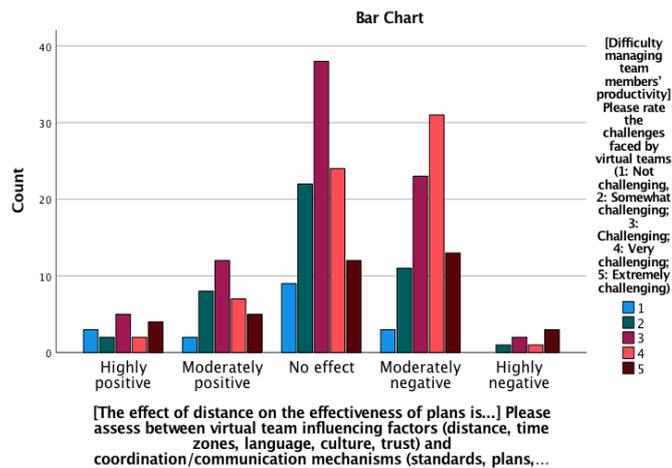
Appendix



Relation between distance and leading teams remotely

Difficulty managing team members' productivity

Frequencies were not significantly different between distance and difficulty managing team members' productivity, $X^2(16, N = 243) = 20.835, p = .185$, and difficulty managing team members' productivity was found challenging.

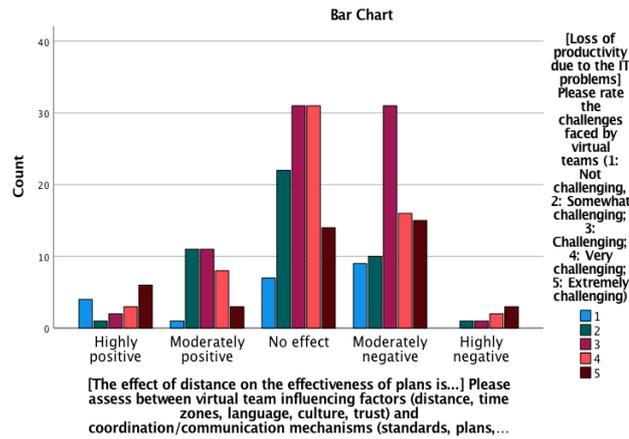


Relation between distance and managing team members' productivity

Loss of productivity due to the IT problems

Frequencies were significantly different between distance and loss of productivity due to the IT problems, $X^2(16, N = 243) = 29.735, p = .019$, and loss of productivity due to the IT problems was found challenging.

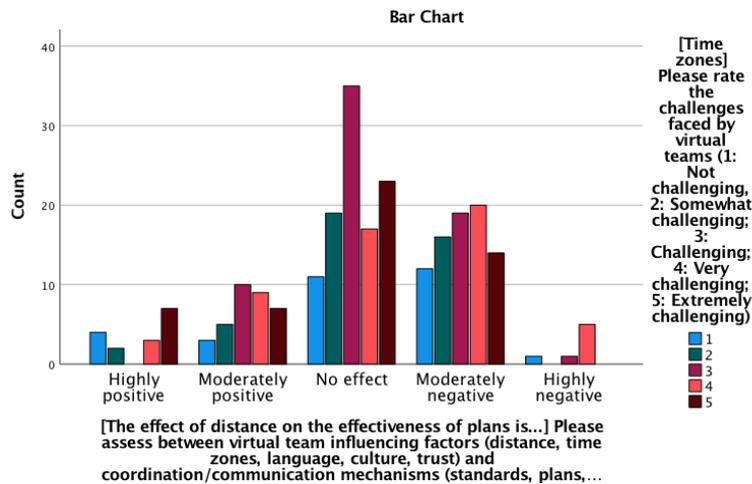
Appendix



Relation between distance and loss of productivity due to the IT problems

Time zones

Frequencies were significantly different between distance and time zones, $X^2(16, N = 243) = 27.611$, $p = .035$, and time zones were found challenging.

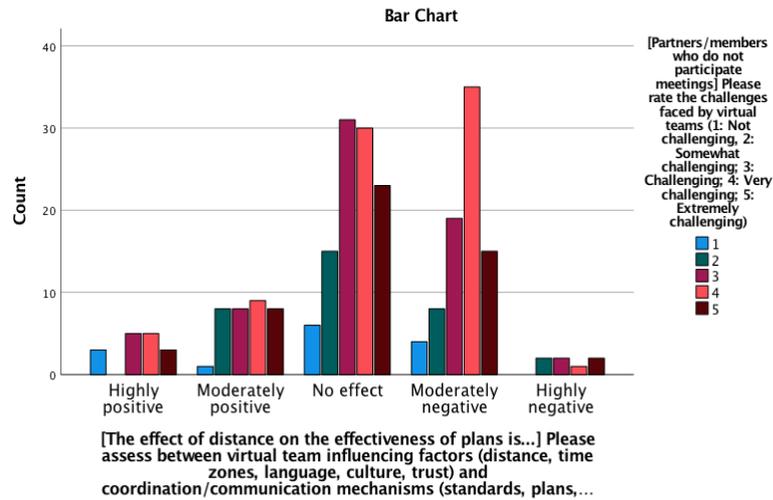


Relation between distance and time zones

Partners/members who do not participate meetings

Frequencies were not significantly different between distance and partners/members who do not participate meetings, $X^2(16, N = 243) = 18.213$, $p = .312$, and partners/members who do not participate meetings were found very challenging.

Appendix

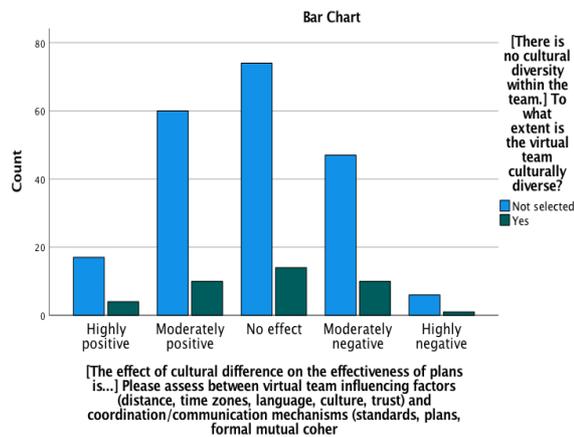


Relation between distance and partners/members who do not participate meetings

Appendix 44. H12 & Cultural Difference Comparison

There is no cultural diversity within the team

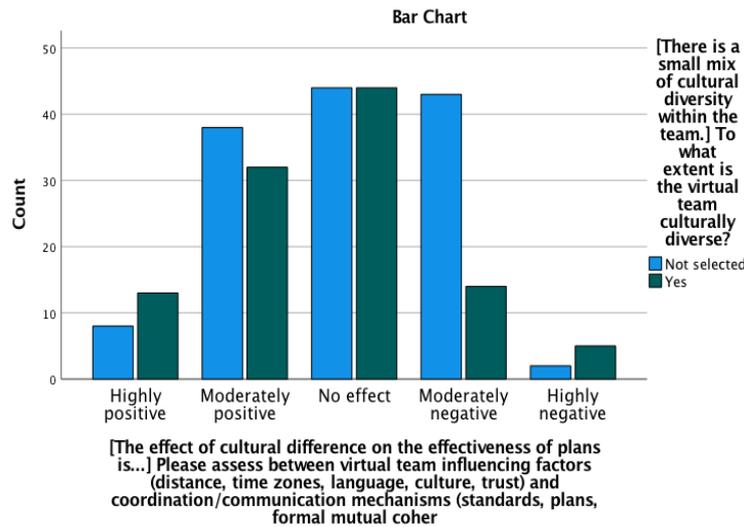
To understand the impact if there is no cultural diversity within the team, on the effectiveness of plans, Chi-square test was conducted. Frequencies were not significantly different, $X^2(4, N = 243) = .414, p = .981$, and if there is no cultural diversity within the team it has no effect on the effectiveness of plans.



No cultural diversity

There is a small mix of cultural diversity within the team

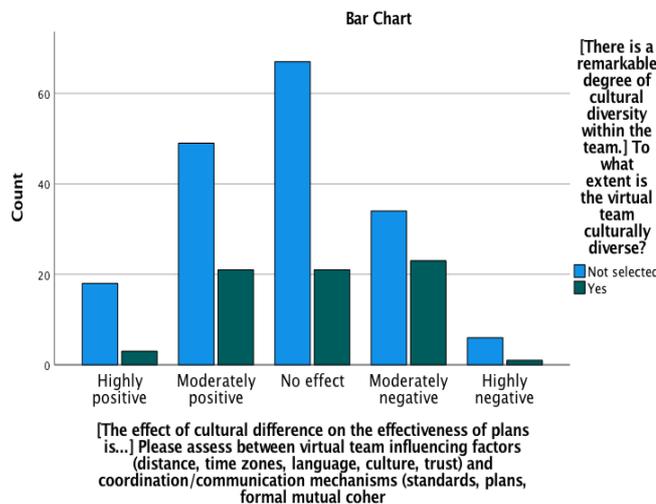
To understand the impact if there is a small mix of cultural diversity within the team, on the effectiveness of plans, Chi-square test was conducted. Frequencies were significantly different, $X^2(4, N = 243) = 14.929, p = .005$, and if there is a small mix of cultural diversity within the team it has no effect on the effectiveness of plans.



Effect of small mix of cultural diversity on effectiveness of plans

There is a remarkable degree of cultural diversity within the team

To understand the impact if there is a remarkable degree of cultural diversity within the team, on the effectiveness of plans, Chi-square test was conducted. Frequencies were not significantly different, $X^2(4, N = 243) = 7.726, p = .102$, and if there is a remarkable degree of cultural diversity within the team it has a moderately negative effect on the effectiveness of plans.

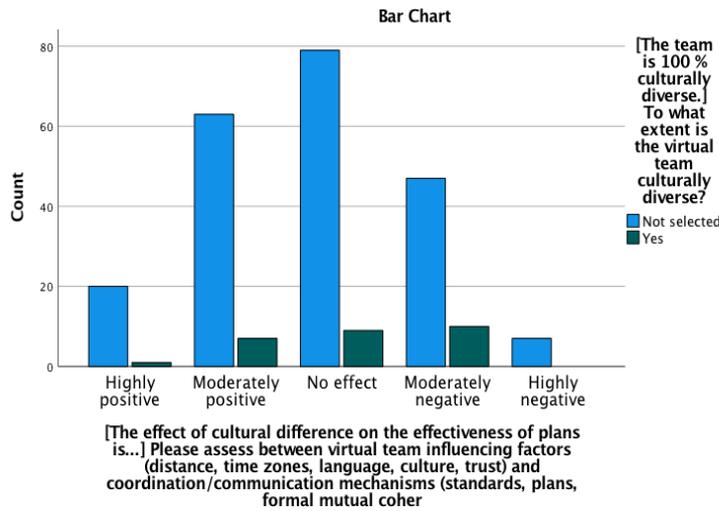


Effect of remarkable degree of cultural diversity on effectiveness of plans

The team is 100 % culturally diverse

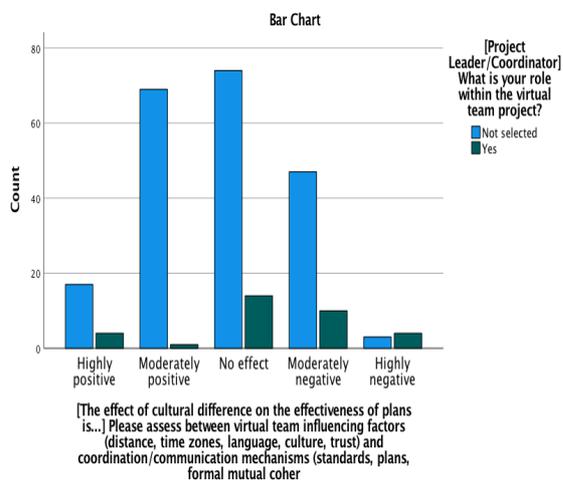
To understand the impact of 100 % culturally diverse on the effectiveness of plans, Chi-square test was conducted. Frequencies were not significantly different, $X^2(4, N = 243) = 4.277, p = .370$, and if the team is 100 % culturally diverse has a moderately negative effect on the effectiveness of plans.

Appendix

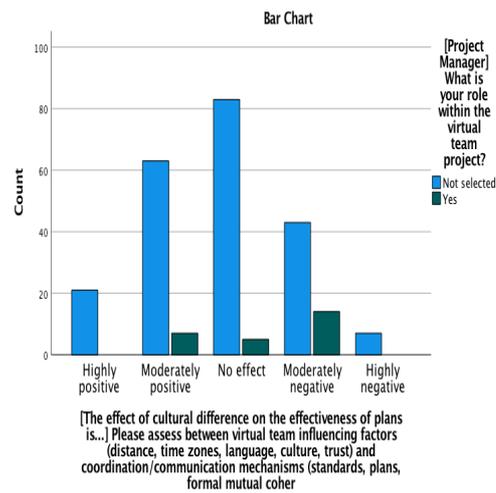


Effect of 100 % cultural diversity on effectiveness of plans

Appendix 45. Hypothesis 12 and Role Comparison

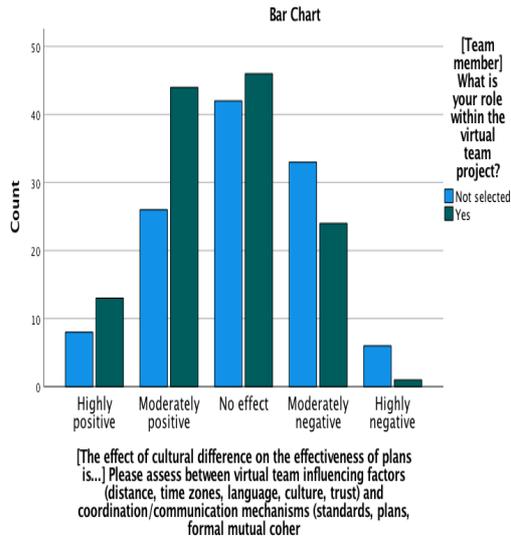


Project Leader/Coordinator

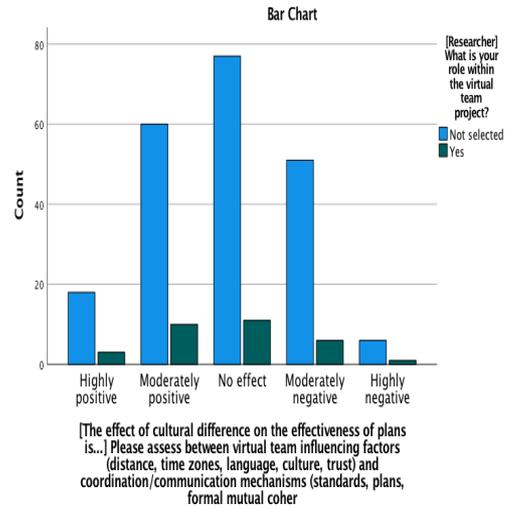


Project Manager

Appendix



Team Member

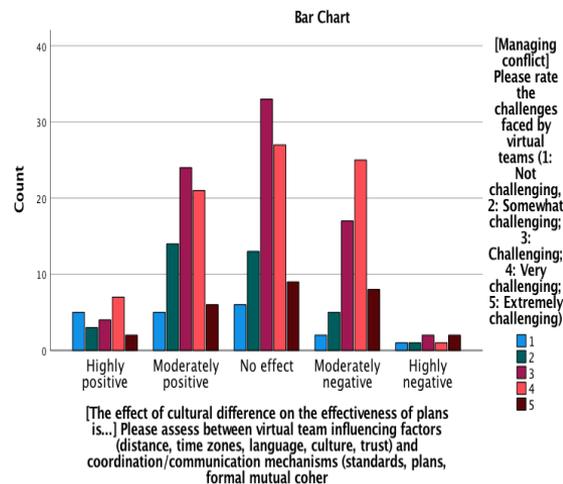


Researcher

Appendix 46. Comparing the Challenges with Hypothesis 12

Managing conflict

To compare the relation between cultural difference and managing conflict, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and managing conflict, $X^2(16, N = 243) = 19.415$, $p = .248$, and managing conflict was found challenging (41.3%).

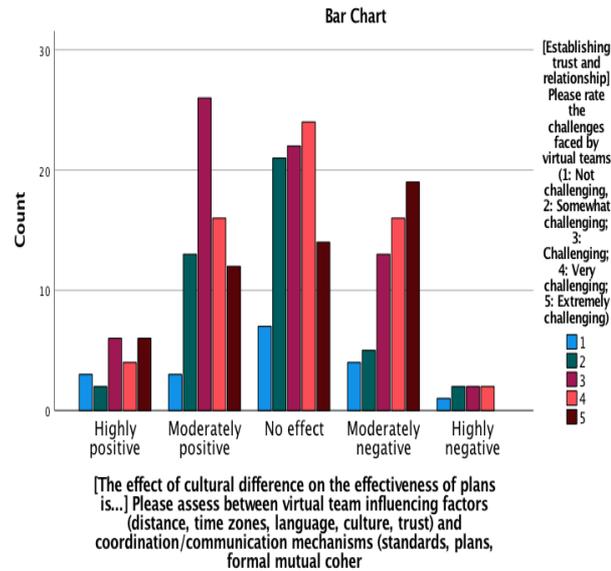


Relation between cultural difference and managing conflict

Establishing trust and relationship

To compare the relation between cultural difference and establishing trust and relationship, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and establishing trust and relationship, $X^2(16, N = 243) = 19.950$, $p = .222$, and establishing trust and relationship was found challenging (37.7%).

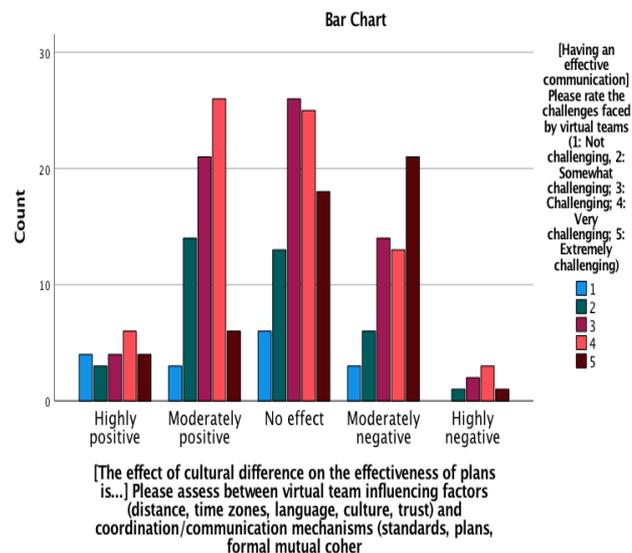
Appendix



Relation between cultural difference and establishing trust and relationship

Having an effective communication

To compare the relation between cultural difference and having an effective communication, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and having an effective communication, $X^2(16, N = 243) = 24.091, p = .088$, and having an effective communication was found challenging (38.8%).

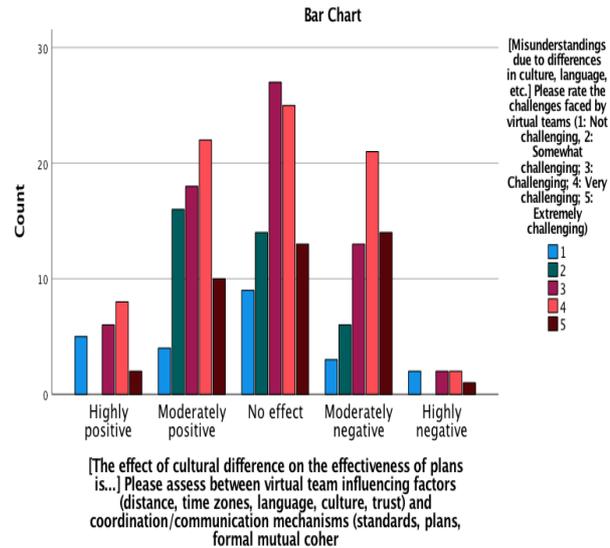


Relation between cultural difference and effective communication

Misunderstandings due to differences in culture, language

To compare the relation between cultural difference and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and misunderstandings due to differences, $X^2(16, N = 243) = 22.584, p = .125$, and misunderstandings due to differences was found challenging (40.9%).

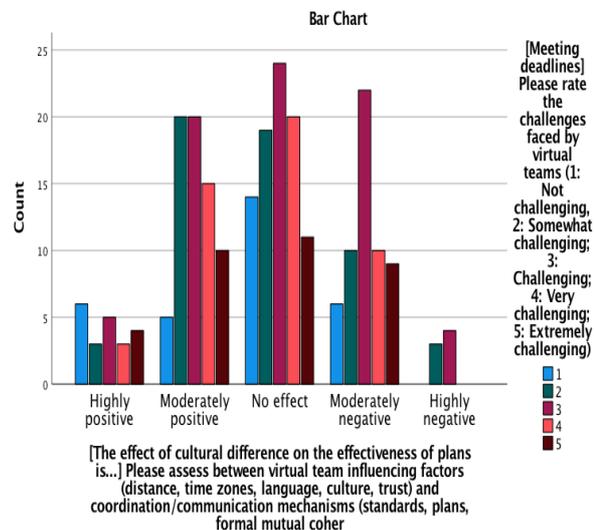
Appendix



Relation between cultural difference and misunderstandings

Meeting deadlines

To compare the relation between cultural difference and meeting deadlines, Chi-square test was conducted. Frequencies were significantly different between cultural difference and meeting deadlines, $X^2(16, N = 243) = 18.814, p = .278$, and meeting deadlines was found challenging (32.0%).

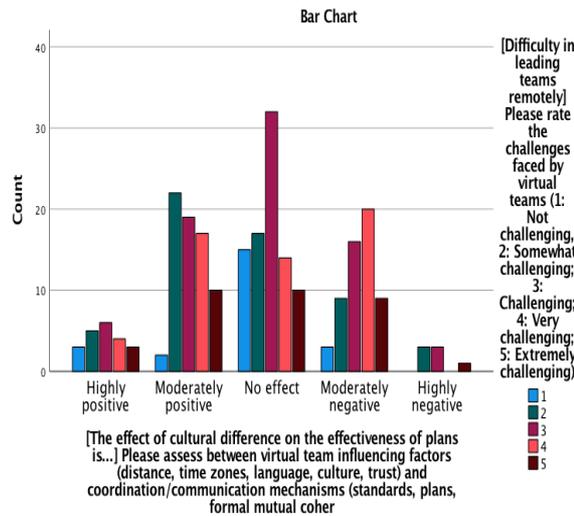


Relation between cultural difference and meeting deadlines

Difficulty in leading teams remotely

To compare the relation between cultural difference and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 25.637, p = .059$, and difficulty in leading teams remotely was found challenging (42.1%).

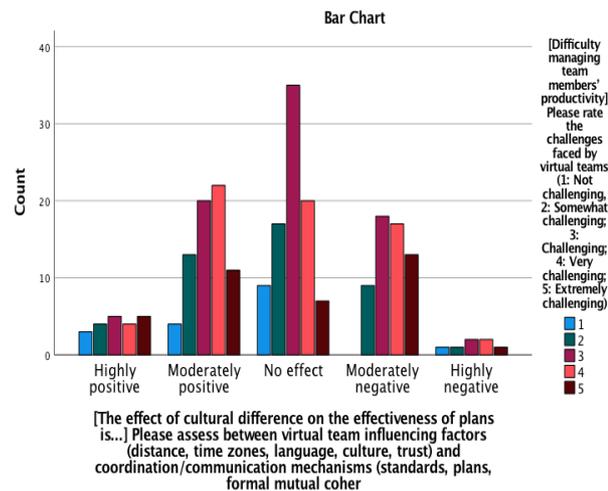
Appendix



Relation between cultural difference and leading teams remotely

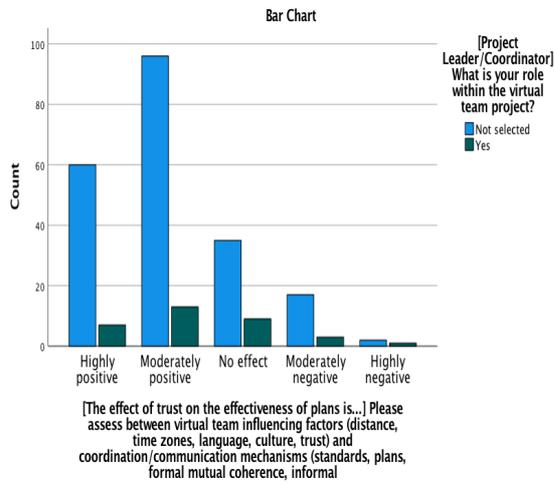
Difficulty managing team members' productivity

To compare the relation between cultural difference and difficulty managing team members' productivity, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 18.185$, $p = .313$, and difficulty managing team members' productivity was found challenging (43.8%).

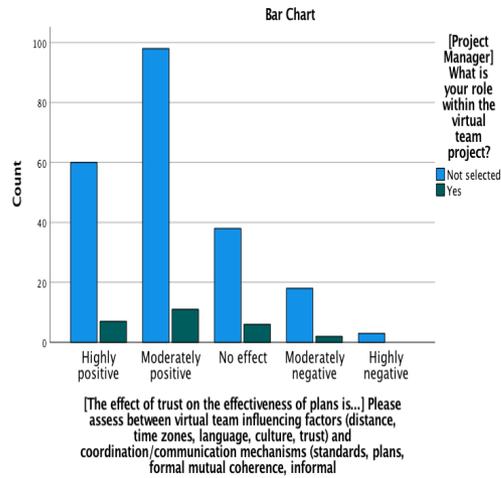


Relation between cultural difference and managing team members' productivity

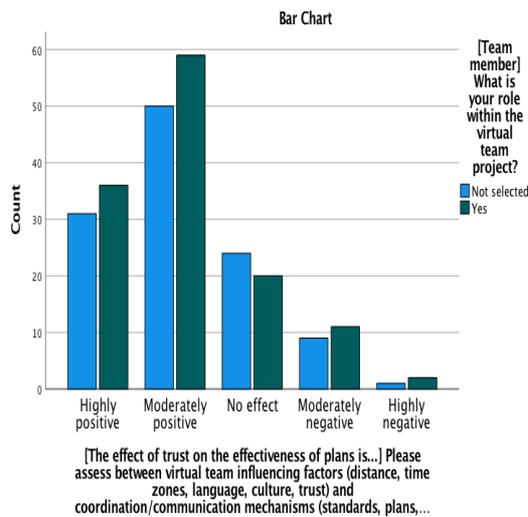
Appendix 47. Hypothesis 13 and Role Comparison



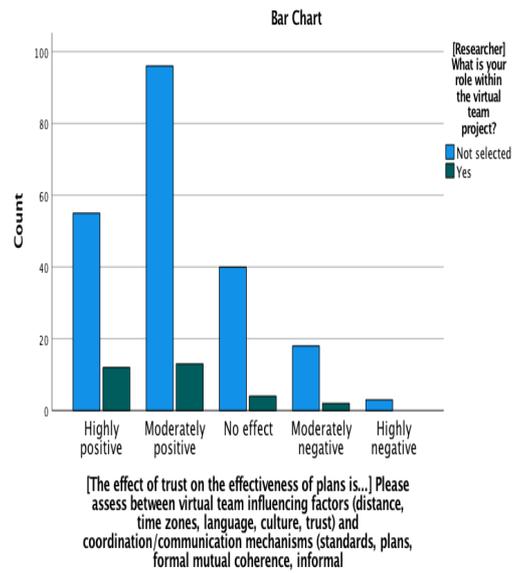
Project Leader/Coordinator



Project Manager



Team Member



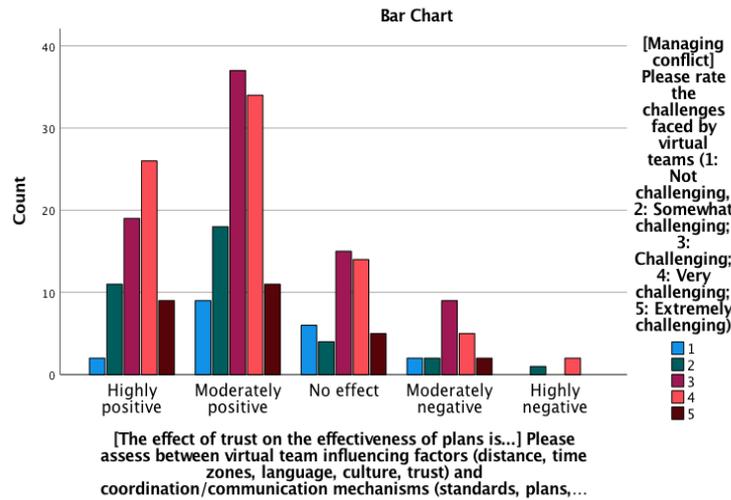
Researcher

Appendix 48. Comparing the Challenges with Hypothesis 13

Managing conflict

To compare the relation between trust and managing conflict, Chi-square test was conducted. Frequencies were not significantly different between trust and managing conflict, $X^2(16, N = 243) = 11.933, p = .749$, and managing conflict was found challenging (46.3%).

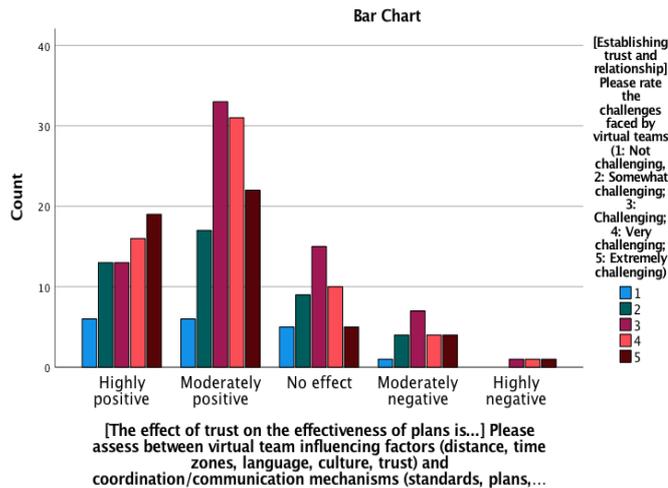
Appendix



Relation between trust and managing conflict

Establishing trust and relationship

To compare the relation between trust and establishing trust and relationship, Chi-square test was conducted. Frequencies were not significantly different between trust and establishing trust and relationship, $X^2(16, N = 243) = 10.916$, $p = .815$, and establishing trust and relationship was found challenging (47.8%).

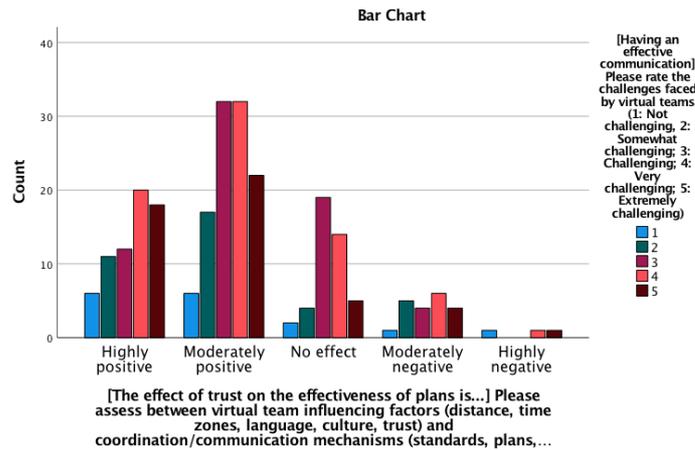


Relation between trust and establishing trust and relationship

Having an effective communication

To compare the relation between trust and having an effective communication, Chi-square test was conducted. Frequencies were not significantly different between trust and having an effective communication, $X^2(16, N = 243) = 18.203$, $p = .312$, and having an effective communication was found challenging (47.8%).

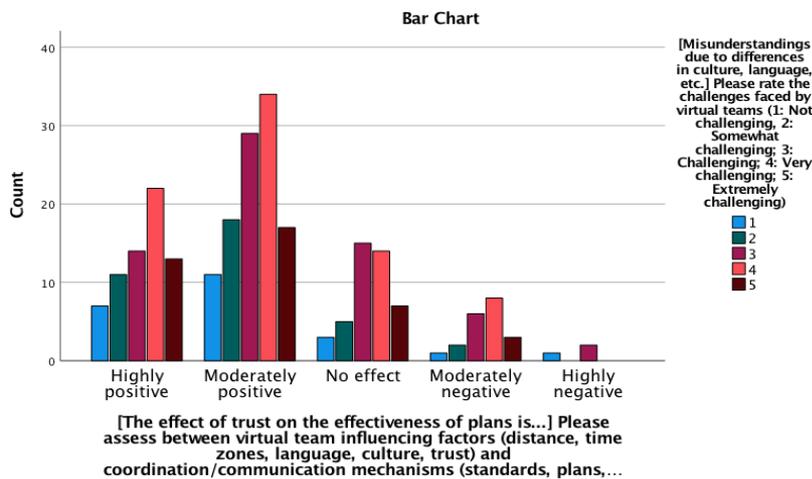
Appendix



Relation between trust and effective communication

Misunderstandings due to differences in culture, language

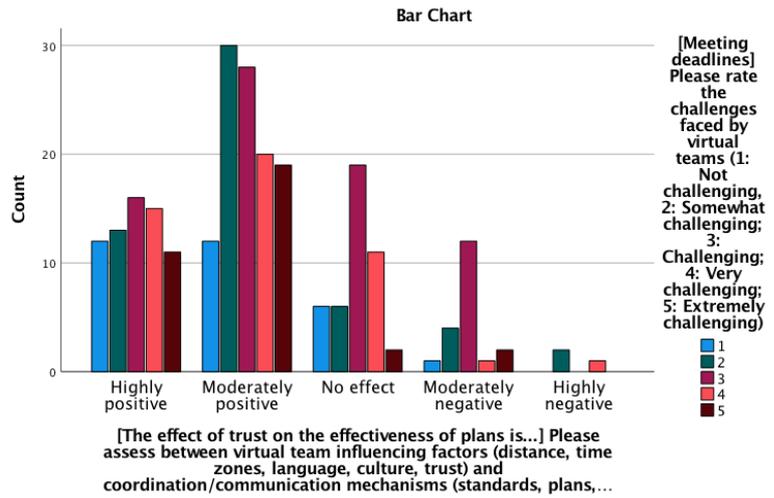
To compare the relation between trust and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between trust and misunderstandings due to differences, $X^2(16, N = 243) = 9.970$, $p = .868$, and misunderstandings due to differences was found very challenging (43.6%).



Relation between trust and misunderstandings

Meeting deadlines

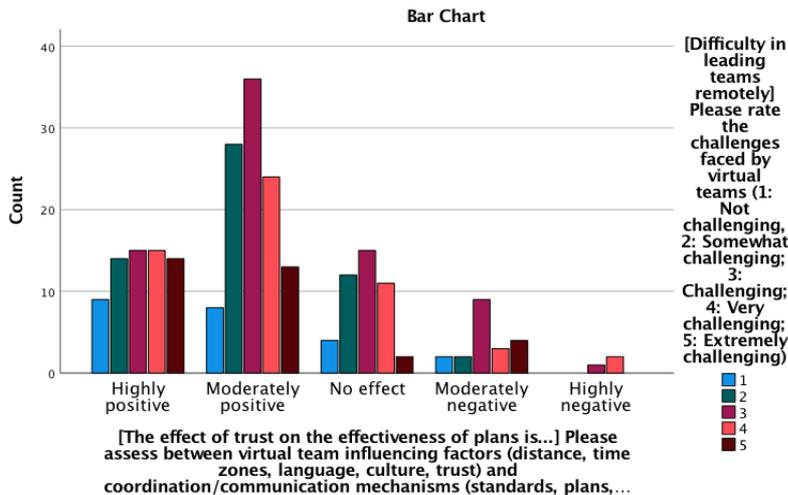
Frequencies were significantly different between trust and meeting deadlines, $X^2(16, N = 243) = 27.367$, $p = .038$, and meeting deadlines was found somewhat challenging (54.5%).



Relation between trust and meeting deadlines

Difficulty in leading teams remotely

To compare the relation between trust and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were not significantly different between trust and difficulty in leading teams remotely, $X^2(16, N = 243) = 17.757, p = .338$, and difficulty in leading teams remotely was found challenging (47.4%).

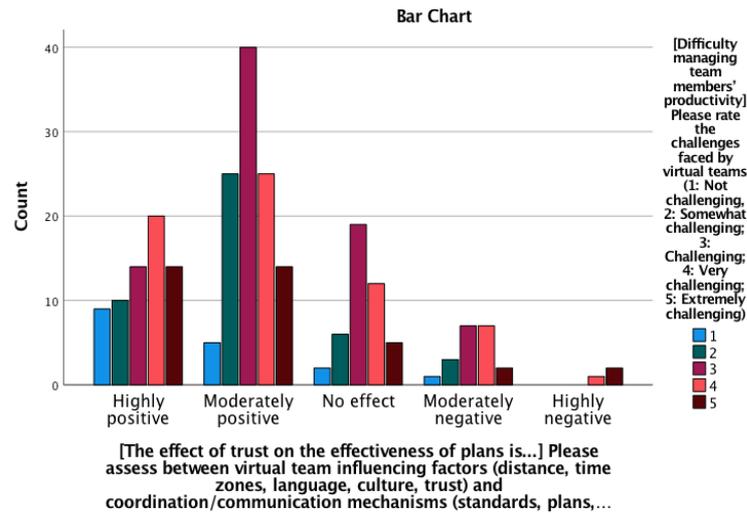


Relation between trust and leading teams remotely

Difficulty managing team members' productivity

To compare the relation between trust and difficulty managing team members' productivity, Chi-square test was conducted. Frequencies were not significantly different between trust and difficulty managing team members' productivity, $X^2(16, N = 243) = 23.543, p = .100$, and difficulty managing team members' productivity was found challenging (50.0%).

Appendix

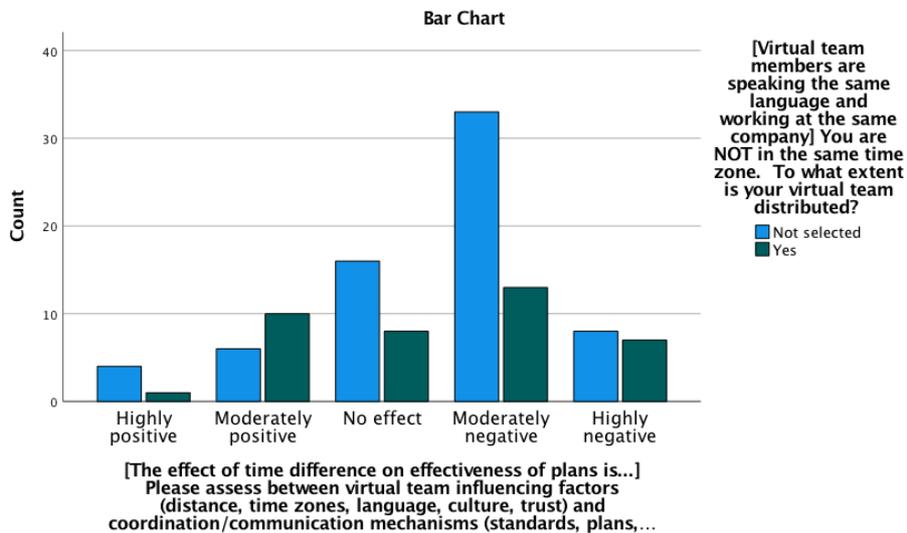


Relation between trust and managing team members' productivity

Appendix 49. H14 & You are NOT in the same time zone

Virtual team members are speaking the same language and working at the same company

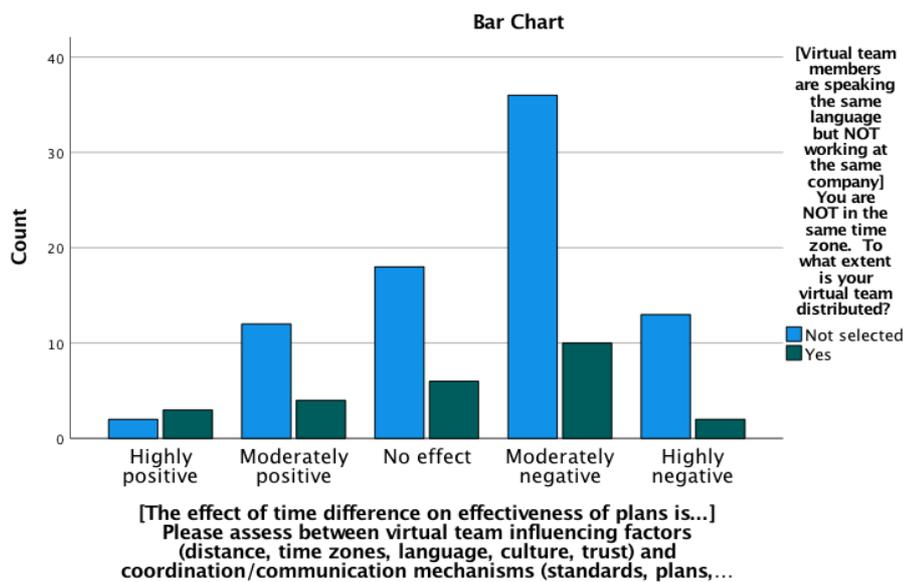
To compare the same language, same company cases and time difference, Chi-square test was conducted. There was not a significant difference between the same language, same company cases and time difference, $X^2(4, N = 106) = 7.345, p = .119$, virtual team members who are speaking the same language and working at the same company rated that time difference has a moderately negative effect on the effectiveness of plans.



Relationship between same language, same company and effectiveness of plans

Virtual team members are speaking the same language but not working at the same company

To compare the same language, different company cases and time difference, Chi-square test was conducted. There was not a significant difference between the same language, different company cases and time difference, $X^2(4, N = 106) = 4.685, p = .321$, virtual team members who are speaking the same language and working at different company rated that time difference has a moderately negative effect on the effectiveness of plans.

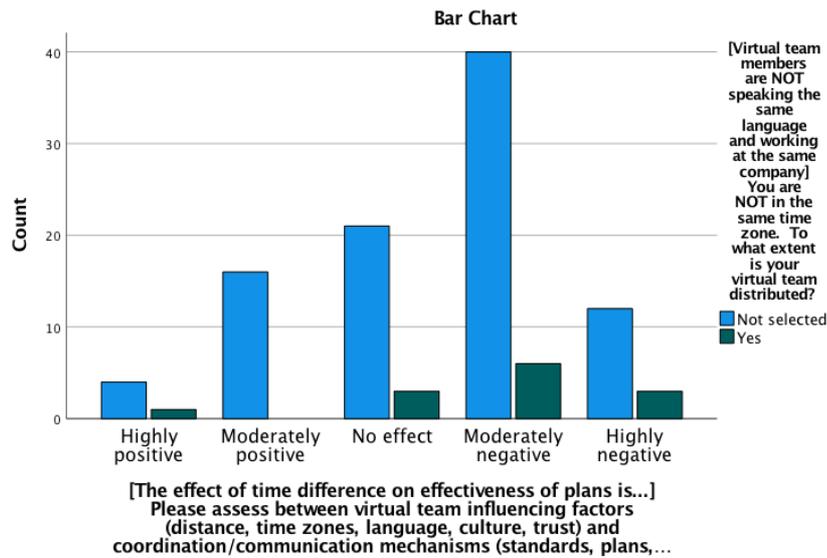


Relationship between same language, different company and effectiveness of plans

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases and time difference, Chi-square test was conducted. There was not a significant difference between the different language, same company cases and time difference, $X^2(4, N = 106) = 3.376, p = .497$, virtual team members who are speaking different language and working at the same company rated that time difference has a moderately negative effect on the effectiveness of plans.

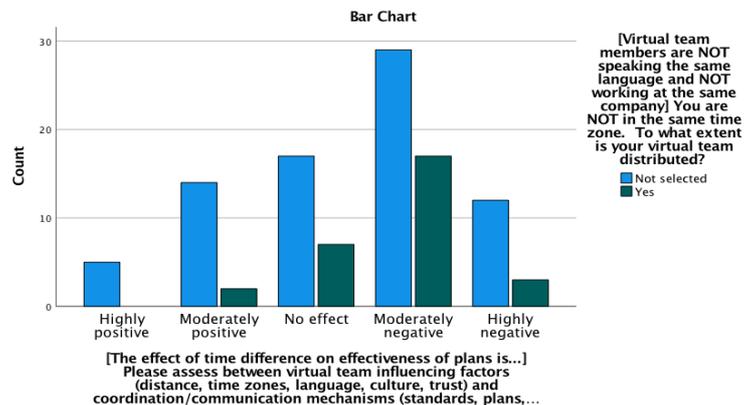
Appendix



Relationship between different language, same company and effectiveness of plans

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases and time difference, Chi-square test was conducted. There was not a significant difference between the different language, different company cases and time difference, $X^2(4, N = 106) = 6.241, p = .182$, virtual team members who are speaking different language and working at different company rated that time difference has a moderately negative effect on the effectiveness of plans.



Relationship between different language, different company and effectiveness of plans

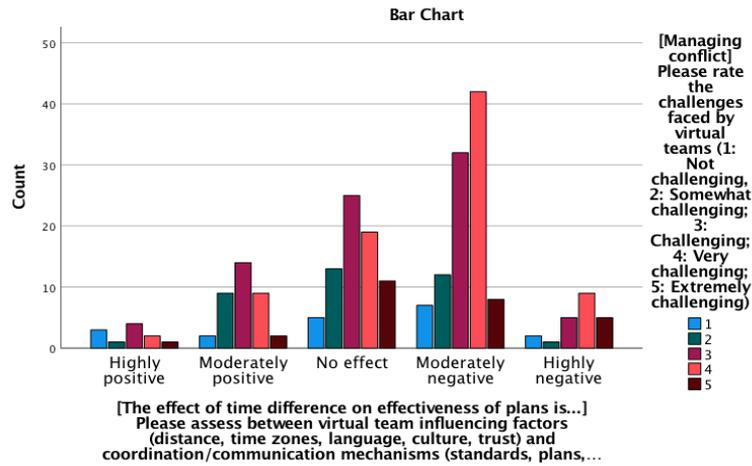
Appendix 50. Comparing the Challenges with Hypothesis 14

Managing conflict

To compare the relation between time difference and managing conflict, Chi-square test was conducted. Frequencies were not significantly different between time difference and managing

Appendix

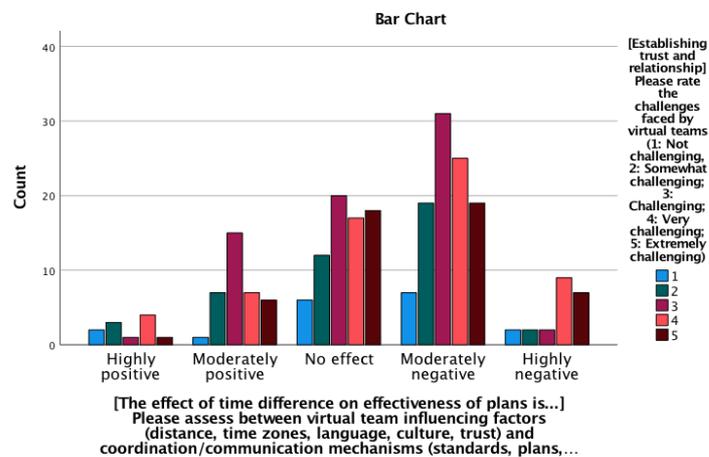
conflict, $X^2(16, N = 243) = 23.147, p = .110$, and managing conflict was found very challenging (51.9%).



Relation between time difference and managing conflict

Establishing trust and relationship

To compare the relation between time difference and establishing trust and relationship, Chi-square test was conducted. Frequencies were not significantly different between time difference and establishing trust and relationship, $X^2(16, N = 243) = 17.636, p = .346$, and establishing trust and relationship was found challenging (44.9%).

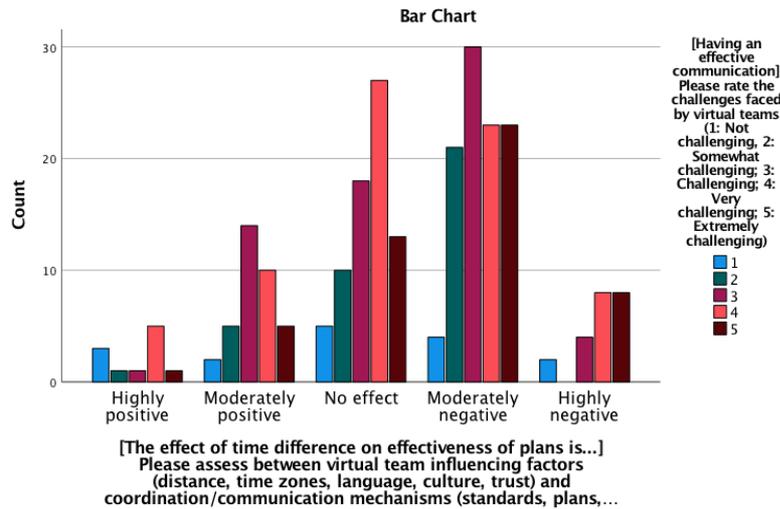


Relation between time difference and establishing trust and relationship

Having an effective communication

Frequencies were significantly different between time difference and having an effective communication, $X^2(16, N = 243) = 27.276, p = .039$, and having an effective communication was found challenging (44.8%).

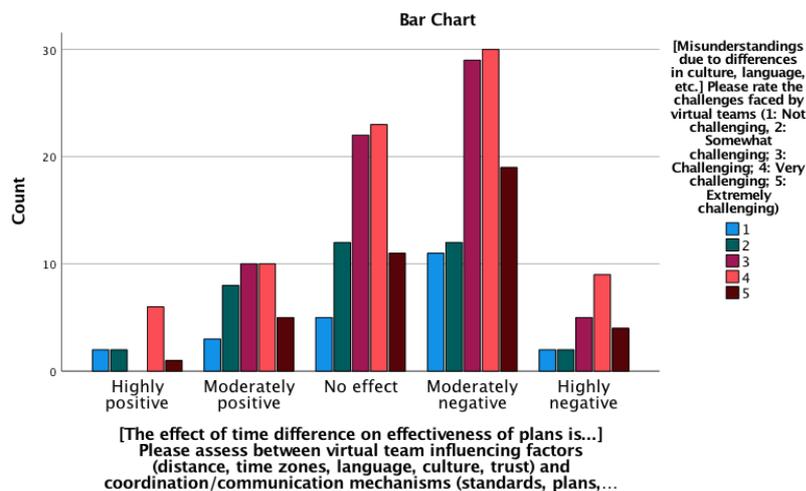
Appendix



Relation between time difference and effective communication

Misunderstandings due to differences in culture, language

To compare the relation between time difference and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between time difference and misunderstandings due to differences, $X^2(16, N = 243) = 11.409$, $p = .784$, and misunderstandings due to differences was found very challenging (38.5%).

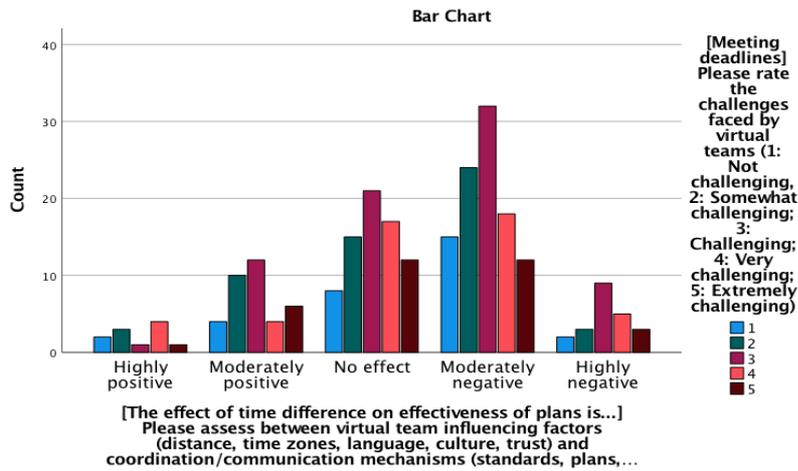


Relation between time difference and misunderstandings

Meeting deadlines

To compare the relation between time difference and meeting deadlines, Chi-square test was conducted. Frequencies were not significantly different between time difference and meeting deadlines, $X^2(16, N = 243) = 9.867$, $p = .873$, and meeting deadlines was found challenging (42.7%).

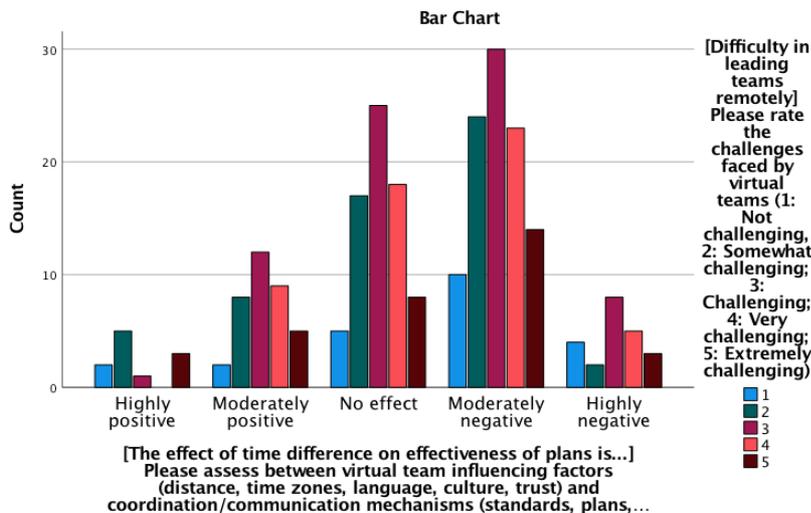
Appendix



Relation between time difference and meeting deadlines

Difficulty in leading teams remotely

To compare the relation between time difference and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were not significantly different between time difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 14.925, p = .530$, and difficulty in leading teams remotely was found challenging (39.5%).

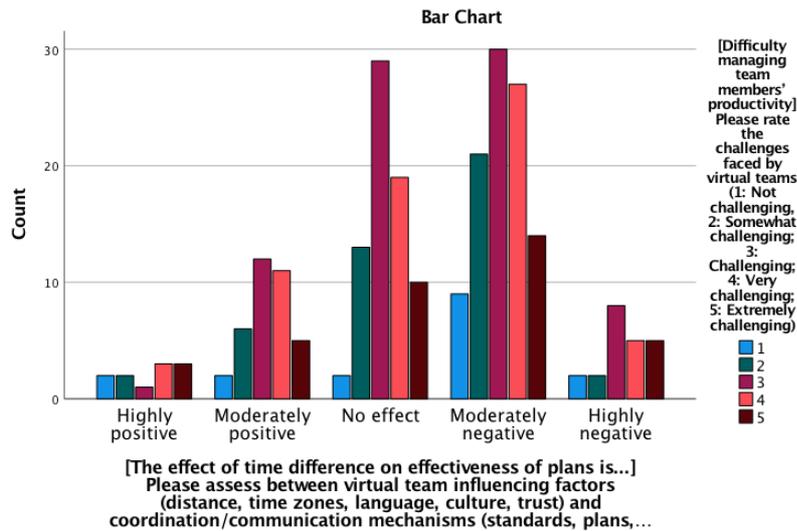


Relation between time difference and leading teams remotely

Difficulty managing team members' productivity

To compare the relation between time difference and difficulty managing team members' productivity, Chi-square test was conducted. Frequencies were not significantly different between time difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 11.872, p = .753$, and difficulty managing team members' productivity was found challenging (37.5%).

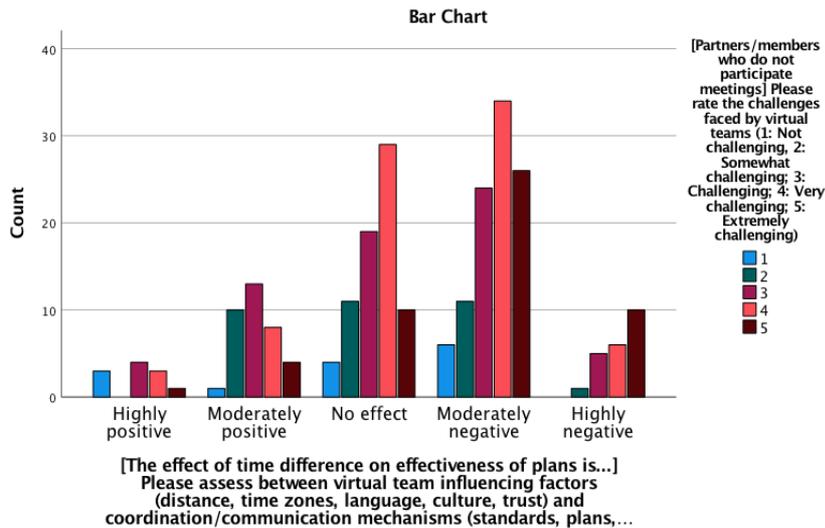
Appendix



Relation between time difference and managing team members' productivity

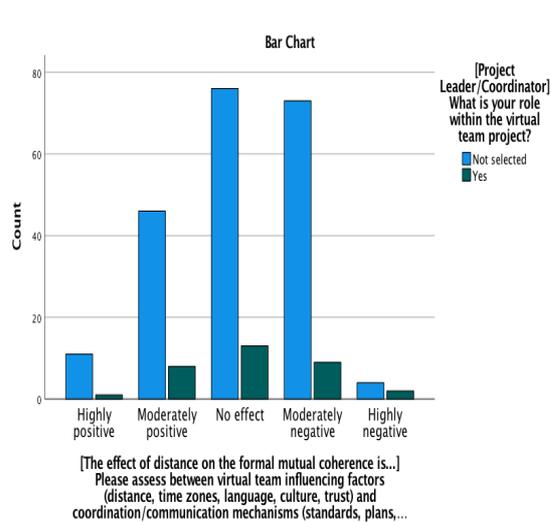
Partners/members who do not participate meetings

Frequencies were significantly different between time difference and partners/members who do not participate meetings, $X^2(16, N = 243) = 35.776, p = .003$, and partners/members who do not participate meetings was found very challenging (42.5%).

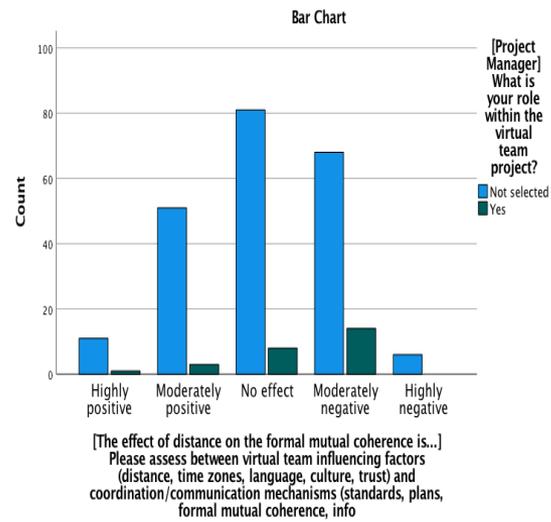


Relation between time difference and partners/members who do not participate meetings

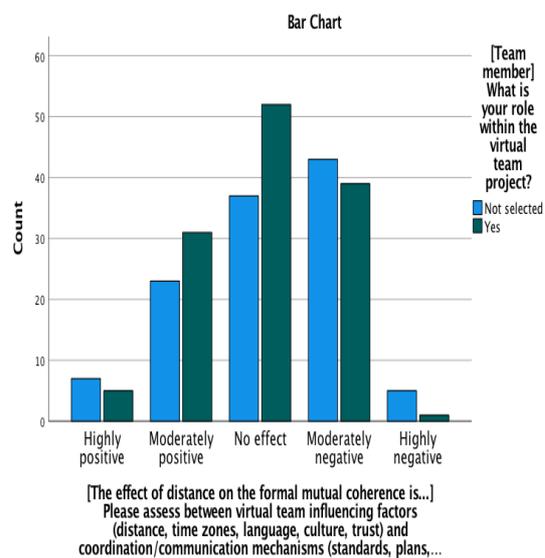
Appendix 51. Hypothesis 15 and Role Comparison



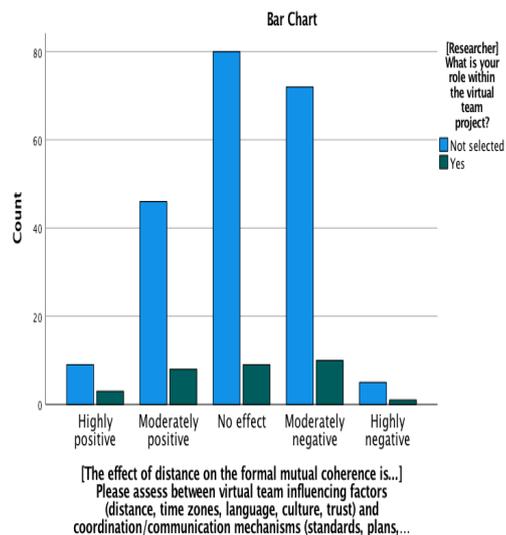
Project Leader/Coordinator



Project Manager



Team Member

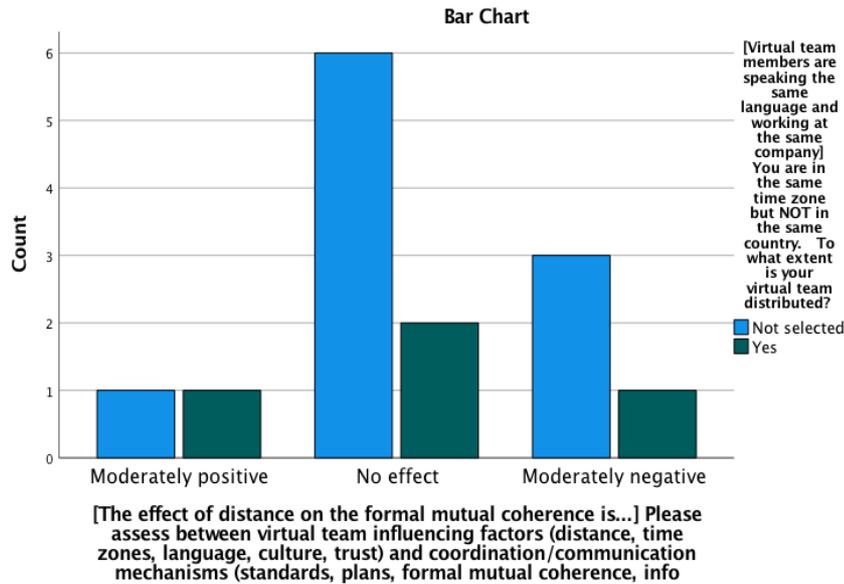


Researcher

Appendix 52. H15 & You are in the same time zone but NOT in the same country

Virtual team members are speaking the same language and working at the same company

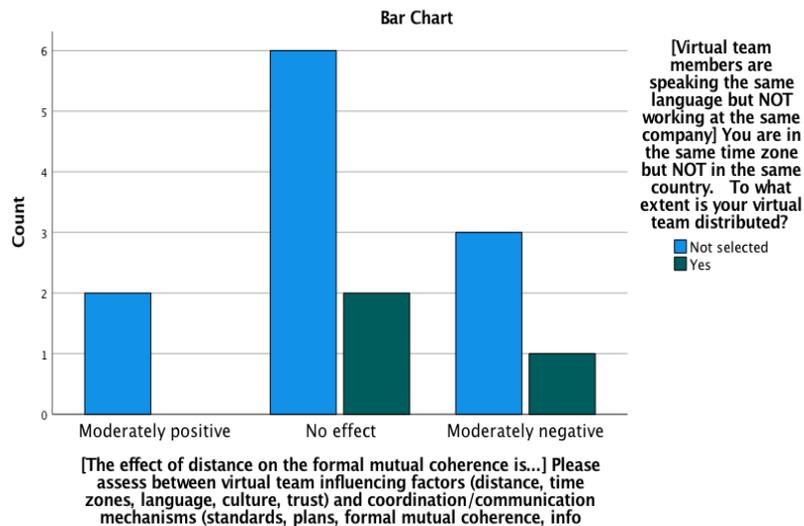
To compare the same language, same company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, same company cases and distance, $X^2(2, N = 14) = .525, p = .769$, virtual team members who are speaking the same language and working at the same company rated that distance has no effect on the formal mutual coherence.



Relationship between same language, same company and formal mutual coherence

Virtual team members are speaking the same language but NOT working at the same company

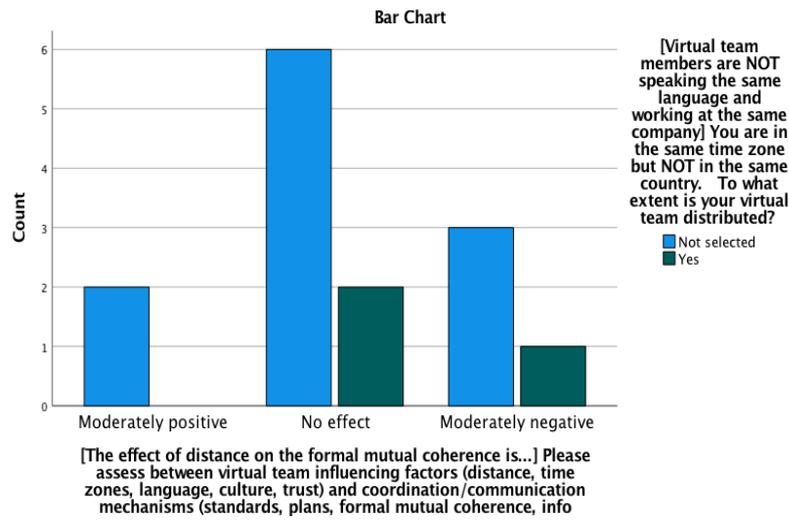
To compare the same language, different company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, different company cases and distance, $X^2(2, N = 14) = .636, p = .727$, virtual team members who are speaking the same language and working at different company rated that distance has no effect on the formal mutual coherence.



Relationship between same language, different company and formal mutual coherence

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases and distance, Chi-square test was conducted. There was no significant difference between the different language, same company cases and distance, $X^2(2, N = 14) = .636, p = .727$, virtual team members who are speaking the different language and working at the same company rated that distance has no effect on the formal mutual coherence.

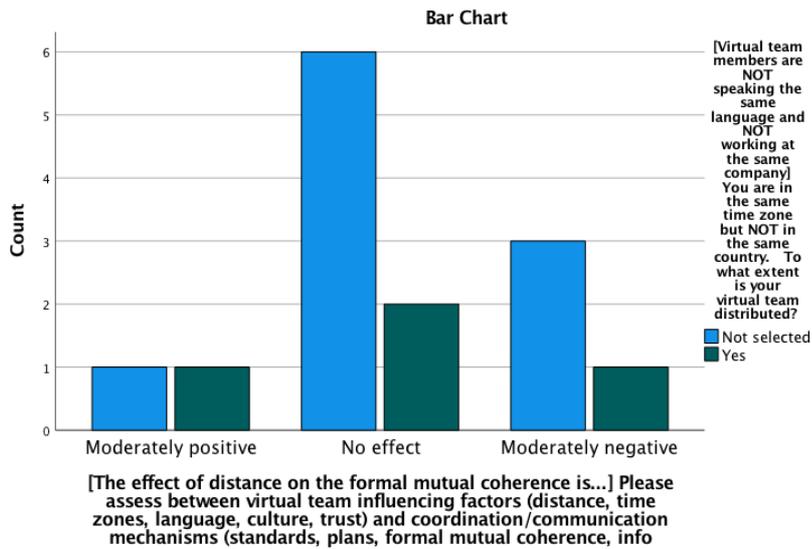


Relationship between different language, same company and formal mutual coherence

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases and distance, Chi-square test was conducted. There was no significant difference between the different language, different company cases and distance, $X^2(2, N = 14) = .525, p = .769$, virtual team members who are speaking the different language and working at different company rated that distance has no effect on the formal mutual coherence.

Appendix

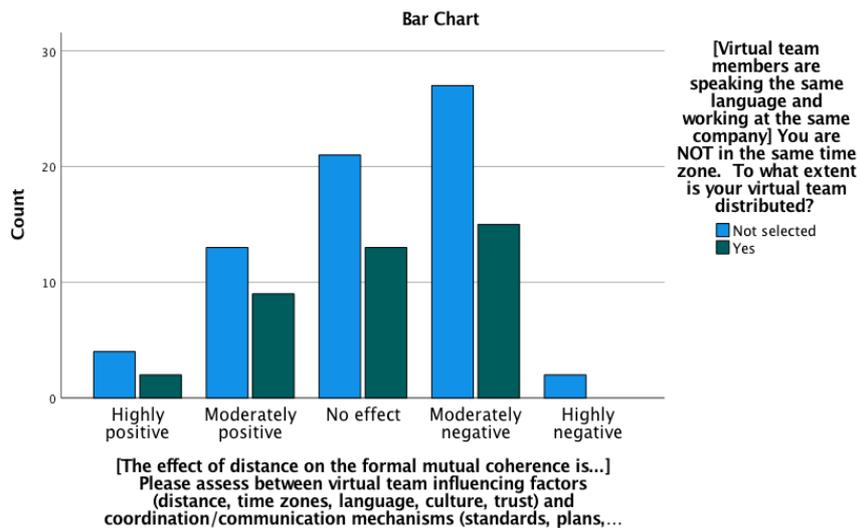


Relationship between different language, different company and formal mutual coherence

Appendix 53. H15 & You are NOT in the same time zone

Virtual team members are speaking the same language and working at the same company

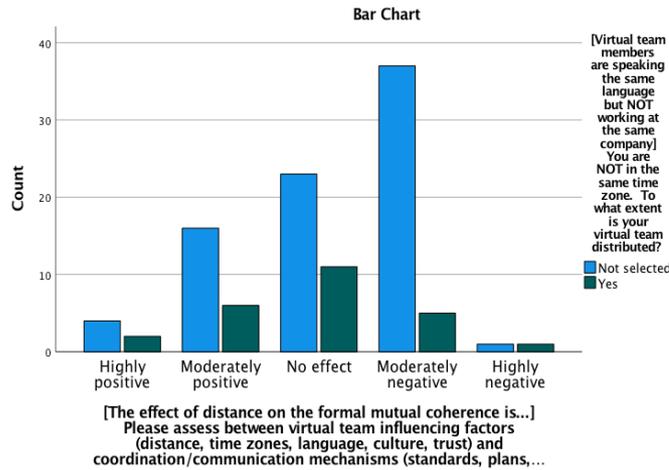
To compare the same language, same company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, same company cases and distance, $X^2(4, N = 106) = 1.407, p = .843$, virtual team members who are speaking the same language and working at the same company rated that distance has a moderately negative effect on the formal mutual coherence.



Relationship between same language, same company and formal mutual coherence

Virtual team members are speaking the same language but NOT working at the same company

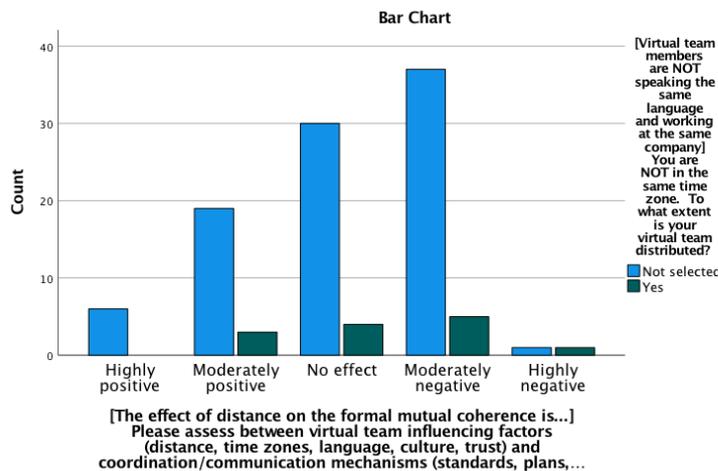
To compare the same language, different company cases and distance, Chi-square test was conducted. There was no significant difference between the same language, different company cases and distance, $X^2(4, N = 106) = 5.886, p = .208$, virtual team members who are speaking the same language and working at different company rated that distance has no effect on the formal mutual coherence.



Relationship between same language, different company and formal mutual coherence

Virtual team members are NOT speaking the same language and working at the same company

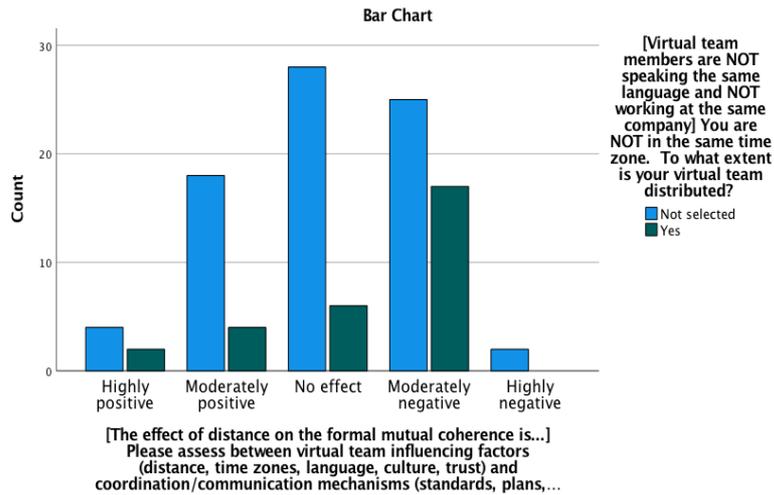
To compare the different language, same company cases and distance, Chi-square test was conducted. There was no significant difference between different language, same company cases and distance, $X^2(4, N = 106) = 3.537, p = .472$, virtual team members who are speaking different language and working at the same company rated that distance has a moderately negative effect on the formal mutual coherence.



Relationship between different language, same company and formal mutual coherence

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases and distance, Chi-square test was conducted. There was no significant difference between different language, different company cases and distance, $X^2(4, N = 106) = 7.043, p = .134$, virtual team members who are speaking different language and working at different company rated that distance has a moderately negative effect on the formal mutual coherence.

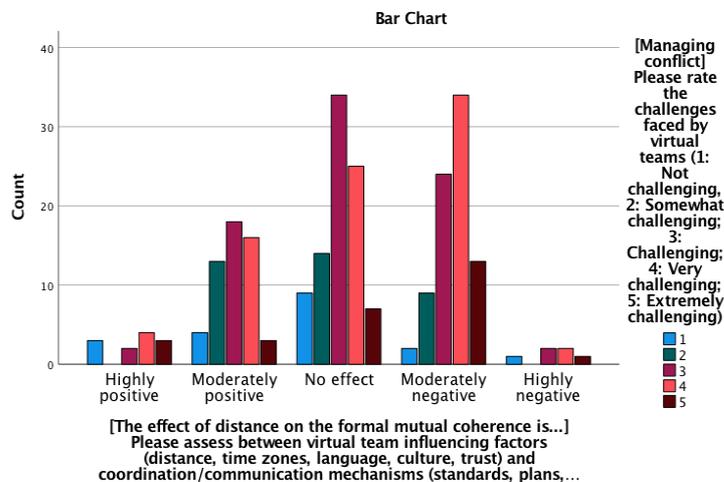


Relationship between different language, different company and formal mutual coherence

Appendix 54. Comparing the Challenges with Hypothesis 15

Managing conflict

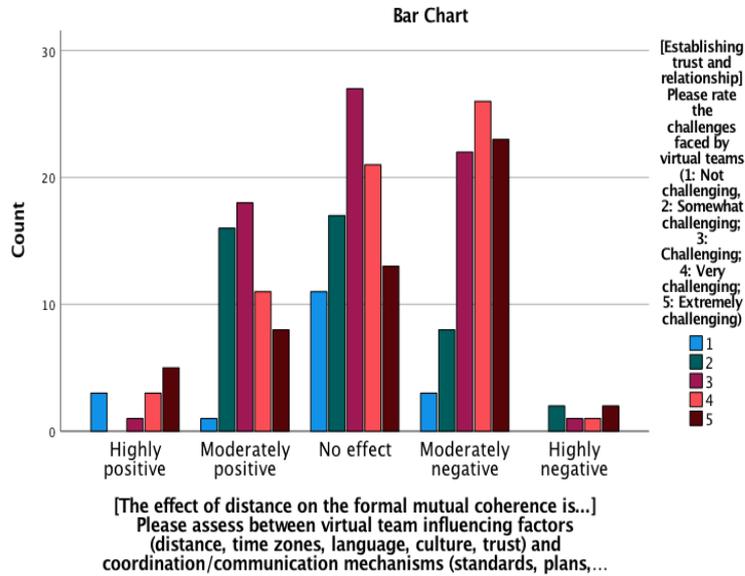
Frequencies were significantly different between distance and managing conflict, $X^2(16, N = 243) = 26.323, p = .050$, and managing conflict was found challenging (42.5%).



Relation between distance and managing conflict

Establishing trust and relationship

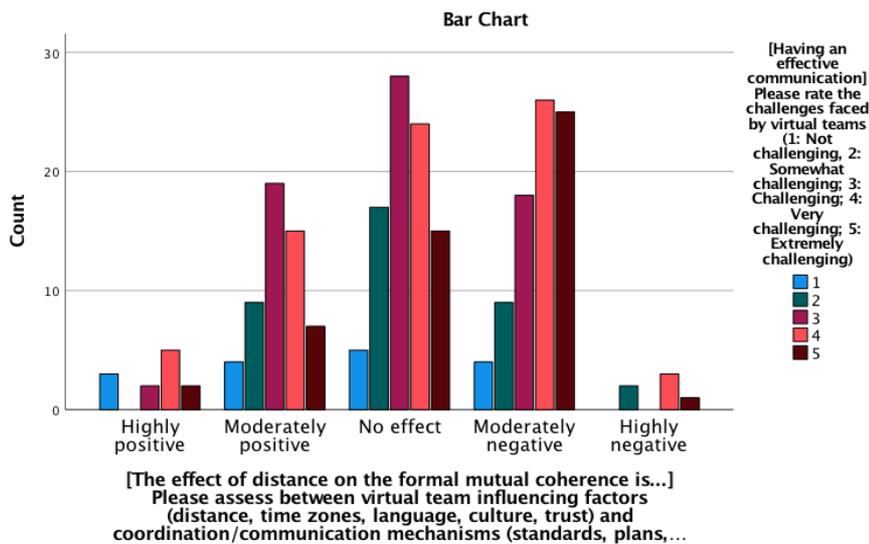
Frequencies were significantly different between establishing trust and relationship and distance, $X^2(16, N = 243) = 34.816, p = .004$, and establishing trust and relationship was found challenging (39.1%).



Relation between distance and establishing trust and relationship

Having an effective communication

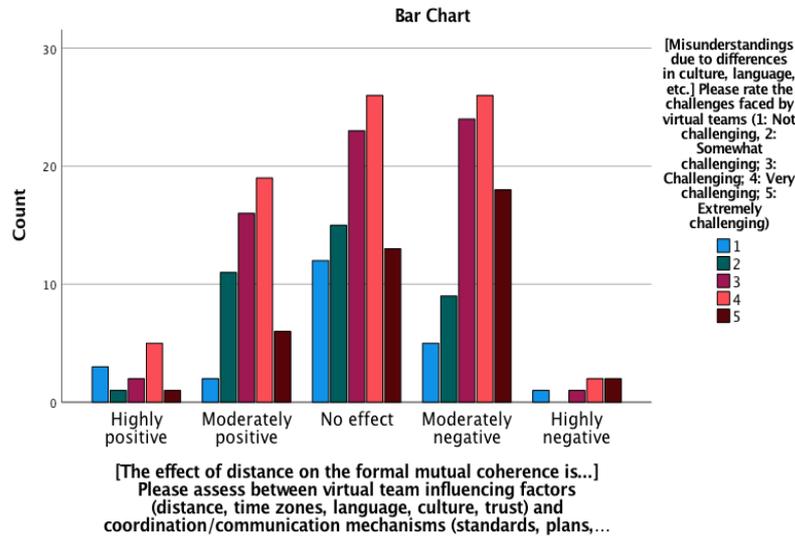
Frequencies were significantly different between distance and effective communication, $X^2(16, N = 243) = 24.851, p = .072$, and having an effective communication was found challenging (41.8%).



Relation between distance and effective communication

Misunderstandings due to differences in culture, language

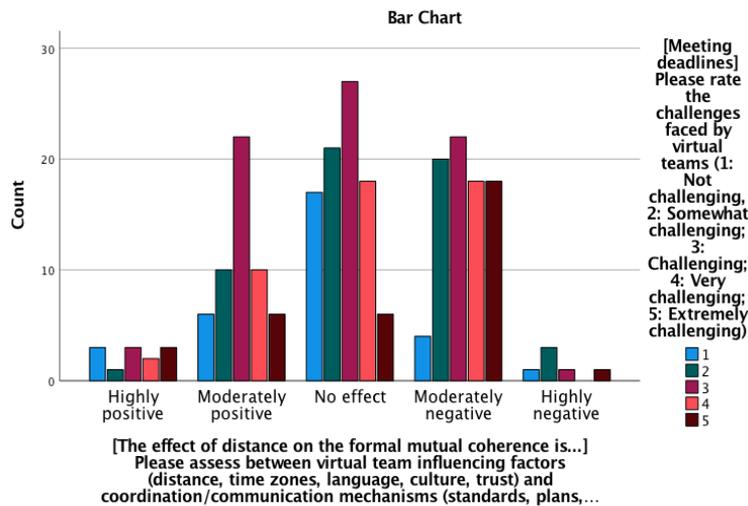
To compare the relation between distance and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between distance and misunderstandings due to differences, $X^2(16, N = 243) = 17.130, p = .377,$ and misunderstandings due to differences was found very challenging (33.3%).



Relation between distance and misunderstandings

Meeting deadlines

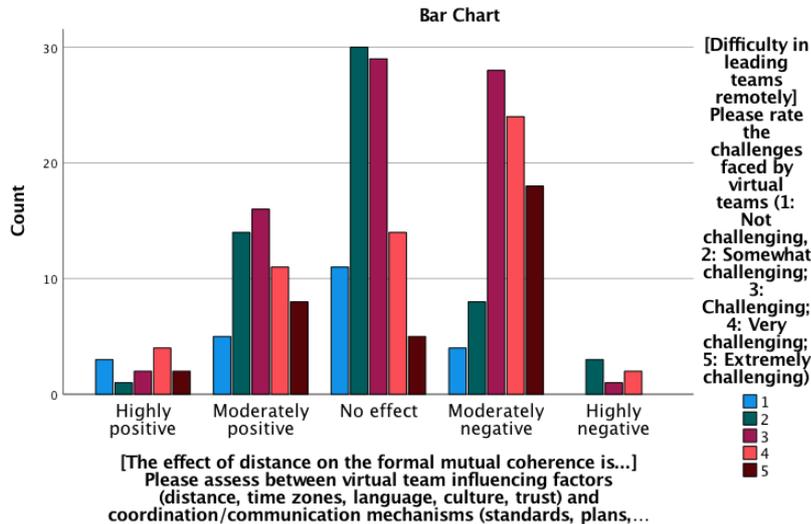
To compare the relation between distance and meeting deadlines, Chi-square test was conducted. Frequencies were not significantly different between distance and meeting deadlines, $X^2(16, N = 243) = 24.631, p = .077,$ and meeting deadlines was found challenging (36.0%).



Relation between distance and meeting deadlines

Difficulty in leading teams remotely

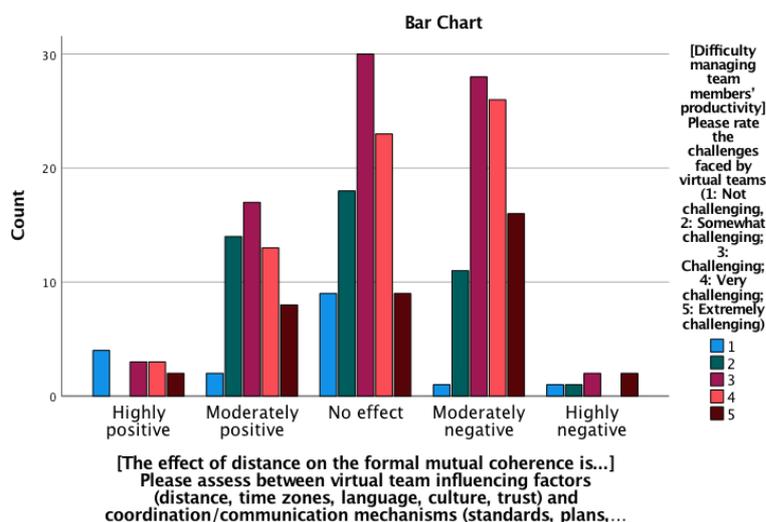
Frequencies were significantly different between distance and difficulty in leading teams remotely, $X^2(16, N = 243) = 35.515, p = .003$, and difficulty in leading teams remotely was found somewhat challenging (53.6%).



Relation between distance and leading teams remotely

Difficulty managing team members' productivity

Frequencies were significantly different between distance and difficulty managing team members' productivity, $X^2(16, N = 243) = 30.598, p = .015$, and difficulty managing team members' productivity was found challenging (37.5%).



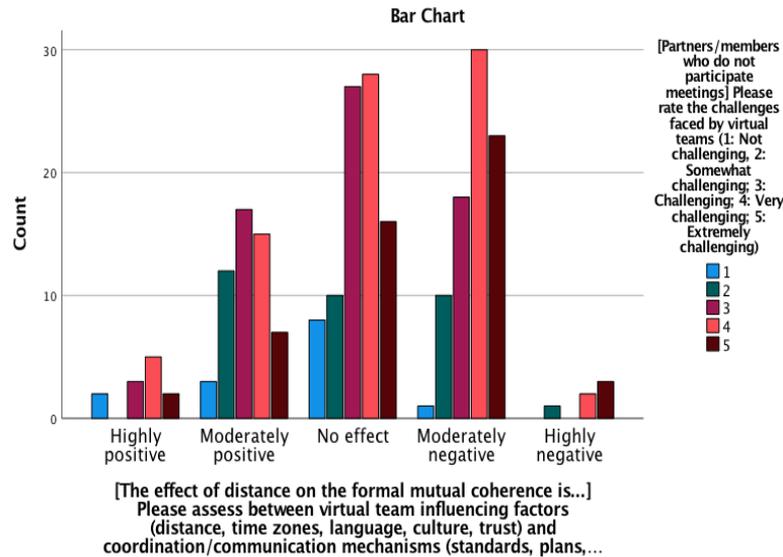
Relation between distance and managing team members' productivity

Partners/members who do not participate meetings

To compare the relation between distance and partners/members who do not participate meetings, Chi-square test was conducted. Frequencies were not significantly different between

Appendix

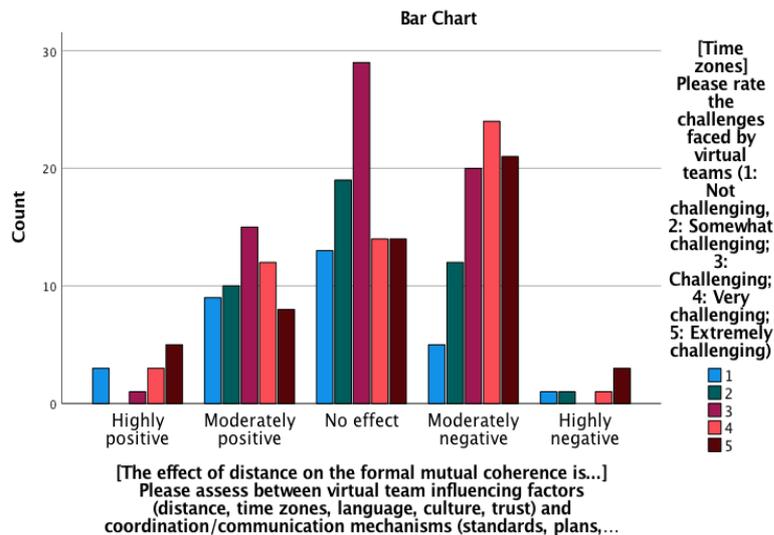
distance and partners/members who do not participate meetings, $X^2(16, N = 243) = 23.301, p = .106$, and partners/members who do not participate meetings was found very challenging (37.5%).



Relation between distance and partners/members who do not participate meetings

Time zones

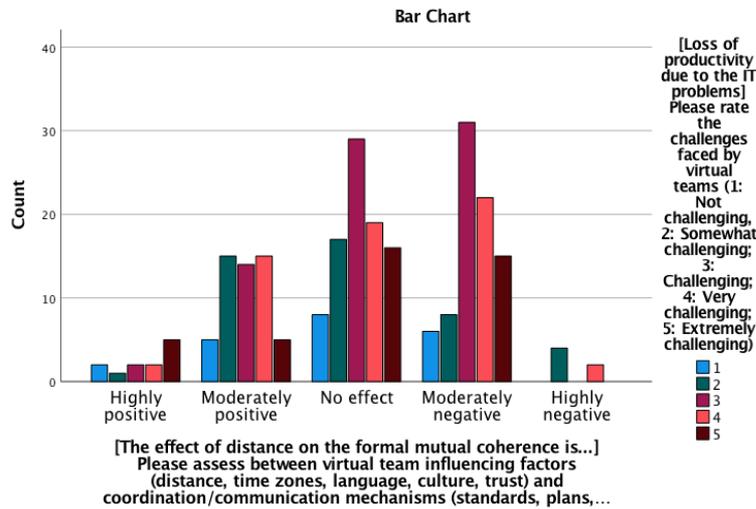
To compare the relation between distance and time zones, Chi-square test was conducted. Frequencies were not significantly different between distance and time zones, $X^2(16, N = 243) = 24.459, p = .080$, and time zones were found challenging (44.6%).



Relation between distance and time zones

Loss of productivity due to the IT problems

Frequencies were significantly different between distance and loss of productivity due to the IT problems, $X^2(16, N = 243) = 28.730, p = .026$, and loss of productivity due to the IT problems were found challenging (40.8%).

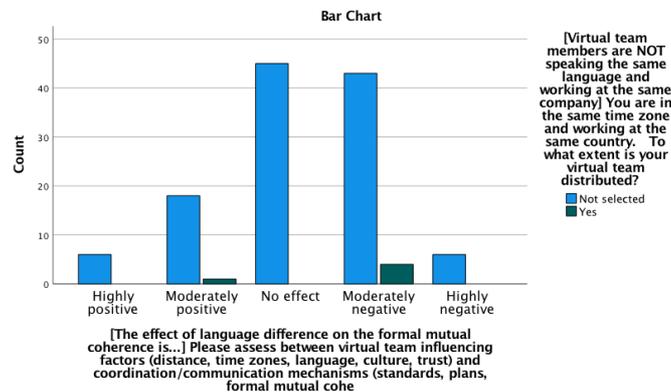


Relation between distance and loss of productivity due to the IT problems

Appendix 55. H16 & You are in the same time zone and working at the same country

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases, Chi-square test was conducted. There was not a significant difference between the different language and same company cases, $X^2(4, N = 123) = 4.867, p = .301$, virtual team members who are speaking different language and working at the same company rated that language difference has a moderately negative effect on the formal mutual coherence.

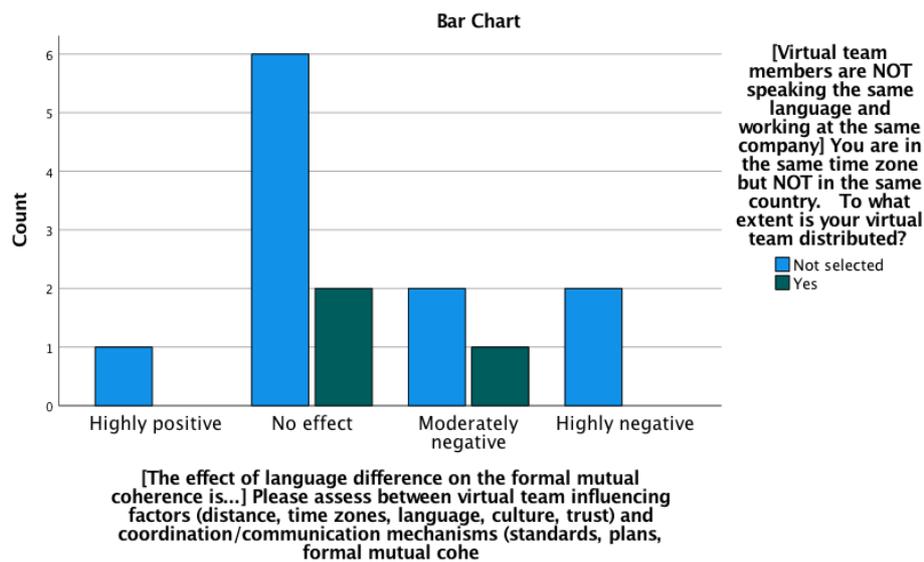


Relationship between different language, same company and formal mutual coherence

Appendix 56. H16 & You are in the same time zone but NOT in the same country

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases, Chi-square test was conducted. There was not a significant difference between the different language and same company cases, $X^2(3, N = 14) = 1.131, p = .770$, virtual team members who are speaking different language and working at the same company rated that language difference has no effect on the formal mutual coherence.

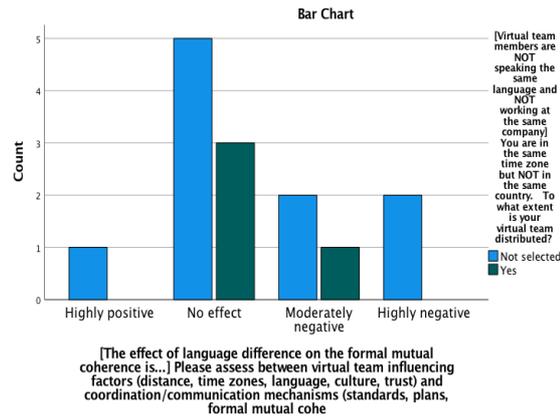


Relationship between different language, same company and formal mutual coherence

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases, Chi-square test was conducted. There was not a significant difference between the different language and different company cases, $X^2(3, N = 14) = 1.546, p = .672$, virtual team members who are speaking different language and working at different company rated that language difference has no effect on the formal mutual coherence.

Appendix

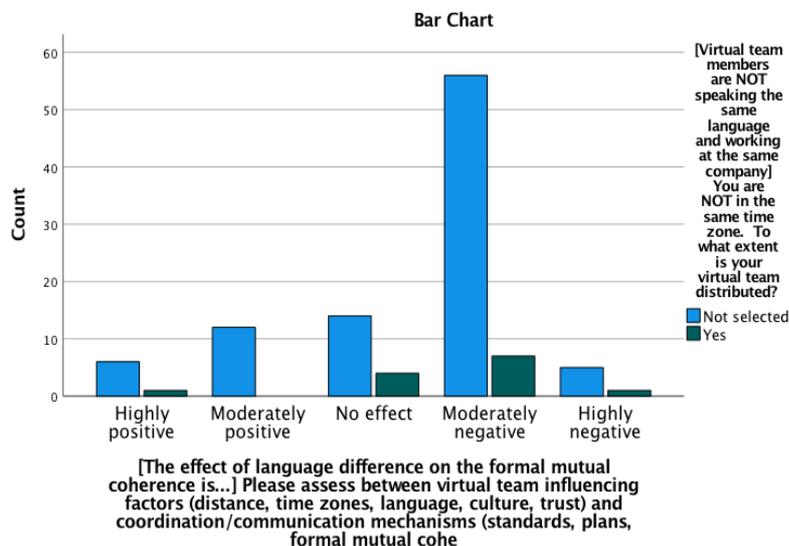


Relationship between different language, different company and formal mutual coherence

Appendix 57. H16 & You are NOT in the same time zone

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases, Chi-square test was conducted. There was not a significant difference between the different language and same company cases, $X^2(4, N = 106) = 3.549, p = .470$, virtual team members who are speaking different language and working at the same company rated that language difference has a moderately negative effect on the formal mutual coherence.



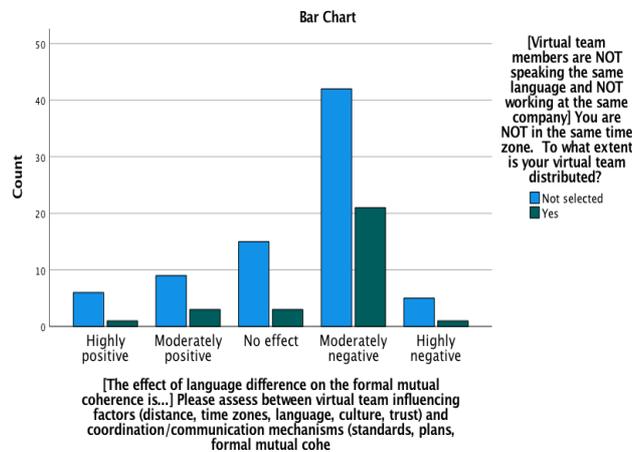
Relationship between different language, same company and formal mutual coherence

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases, Chi-square test was conducted. There was not a significant difference between the different language and different company

Appendix

cases, $X^2(4, N = 106) = 3.148, p = .533$, virtual team members who are speaking different language and working at different company rated that language difference has a moderately negative effect on the formal mutual coherence.

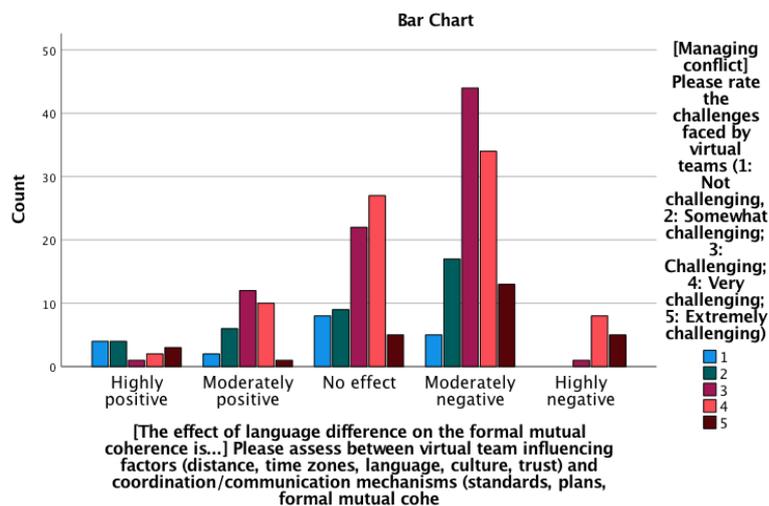


Relationship between different language, different company and formal mutual coherence

Appendix 58. Comparing the Challenges with Hypothesis 16

Managing conflict

Frequencies were significantly different between language difference and managing conflict, $X^2(16, N = 243) = 39.951, p = .001$, and managing conflict was found challenging (55.0%).

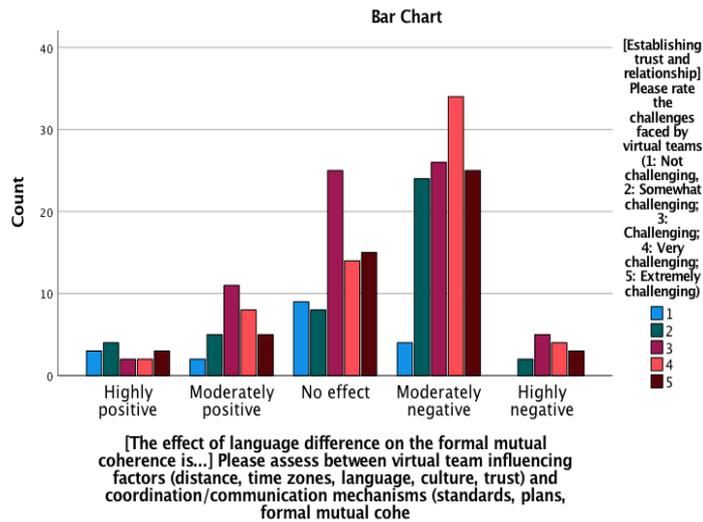


Relation between language difference and managing conflict

Establishing trust and relationship

To compare the relation between language difference and establishing trust and relationship, Chi-square test was conducted. Frequencies were not significantly different between language difference and establishing trust and relationship, $X^2(16, N = 243) = 20.401, p = .203$, and establishing trust and relationship was found very challenging (54.8%).

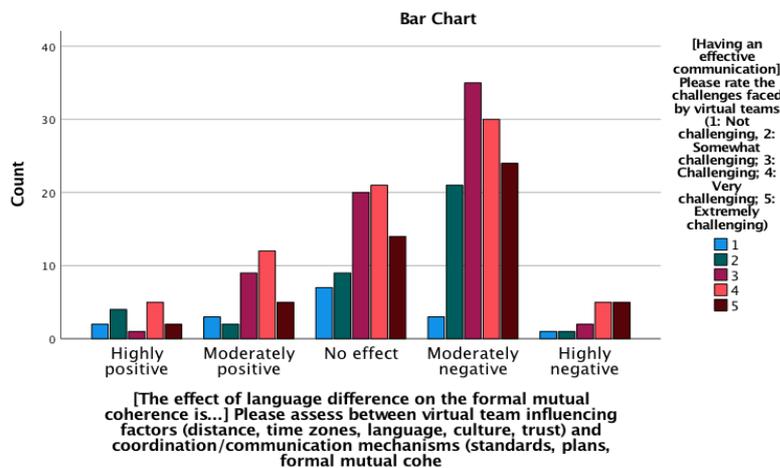
Appendix



Relation between language difference and establishing trust and relationship

Having an effective communication

To compare the relation between language difference and having an effective communication, Chi-square test was conducted. Frequencies were not significantly different between language difference and having an effective communication, $X^2(16, N = 243) = 17.708, p = .341$, and having an effective communication was found challenging (52.2%).

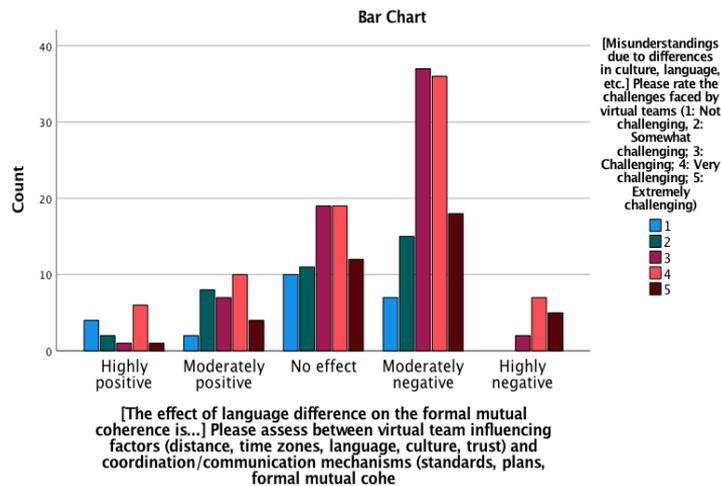


Relation between language difference and effective communication

Misunderstandings due to differences in culture, language

To compare the relation between language difference and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between language difference and misunderstandings due to differences, $X^2(16, N = 243) = 25.860, p = .056$, and misunderstandings due to differences were found challenging (56.1%).

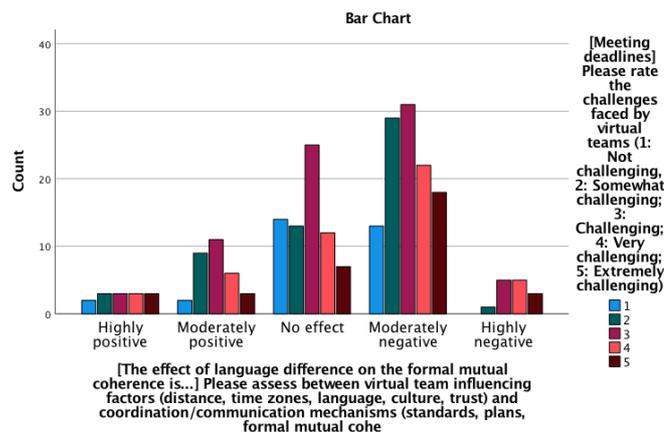
Appendix



Relation between language difference and misunderstandings

Meeting deadlines

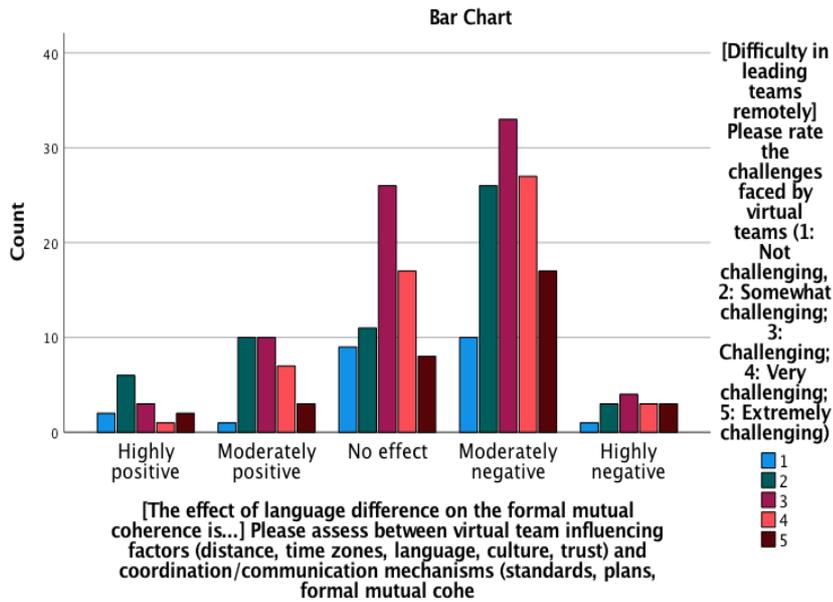
To compare the relation between language difference and meeting deadlines, Chi-square test was conducted. Frequencies were not significantly different between language difference and meeting deadlines, $X^2(16, N = 243) = 15.117, p = .516$, and meeting deadlines were found challenging (41.3%).



Relation between language difference and meeting deadlines

Difficulty in leading teams remotely

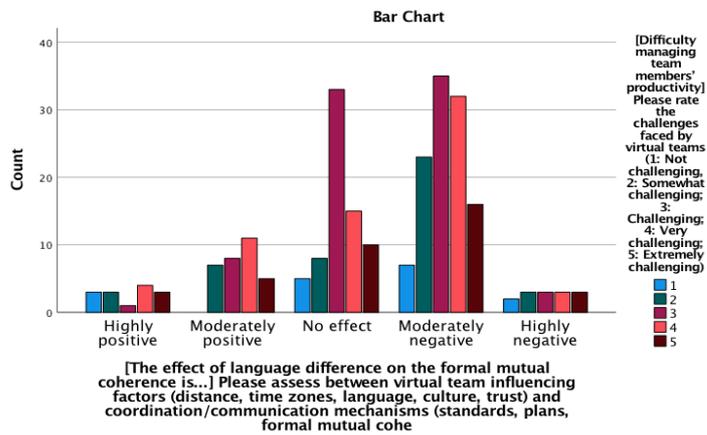
To compare the relation between language difference and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were not significantly different between language difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 12.169, p = .732$, and difficulty in leading teams remotely was found challenging (43.4%).



Relation between language difference and leading teams remotely

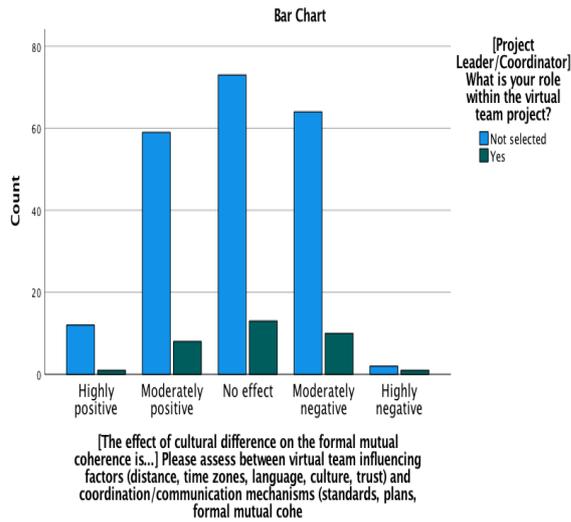
Difficulty managing team members’ productivity

compare the relation between language difference and difficulty managing team members’ productivity, Chi-square test was conducted. Frequencies were not significantly different between language difference and difficulty managing team members’ productivity, $X^2(16, N = 243) = 20.988, p = .179$, and difficulty managing team members’ productivity was found challenging (43.8%).

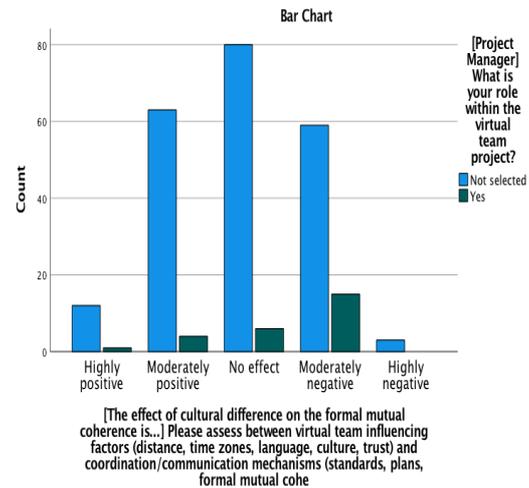


Relation between language difference and managing team members’ productivity

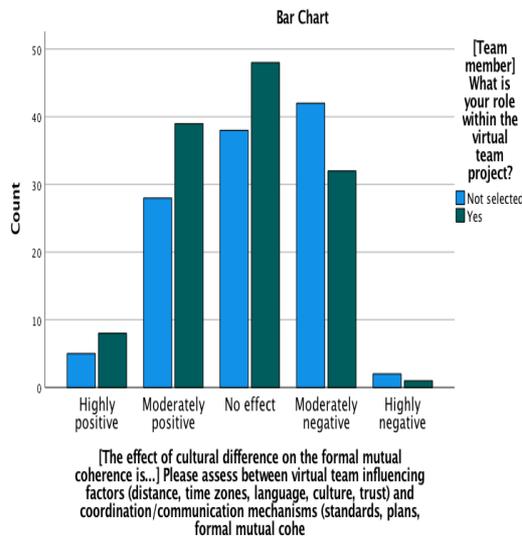
Appendix 59. Hypothesis 17 and Role Comparison



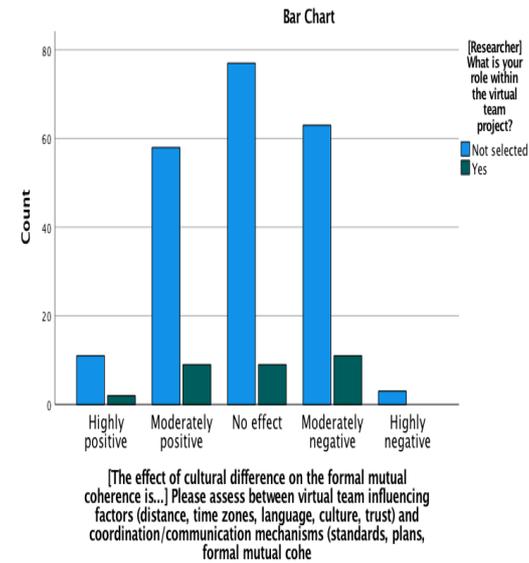
Project Leader/Coordinator



Project Manager



Team Member



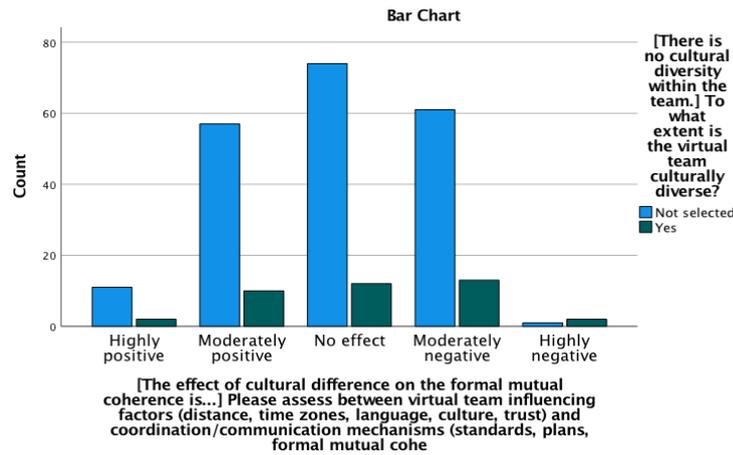
Researcher

Appendix 60. H17 & Cultural Diversity

There is no cultural diversity within the team

To understand the impact if there is no cultural diversity within the team, on the effectiveness of the formal mutual coherence, Chi-square test was conducted. Frequencies were not significantly different, $X^2(4, N = 243) = 6.179, p = .186$, and if there is no cultural diversity within the team it has a moderately negative effect on the formal mutual coherence.

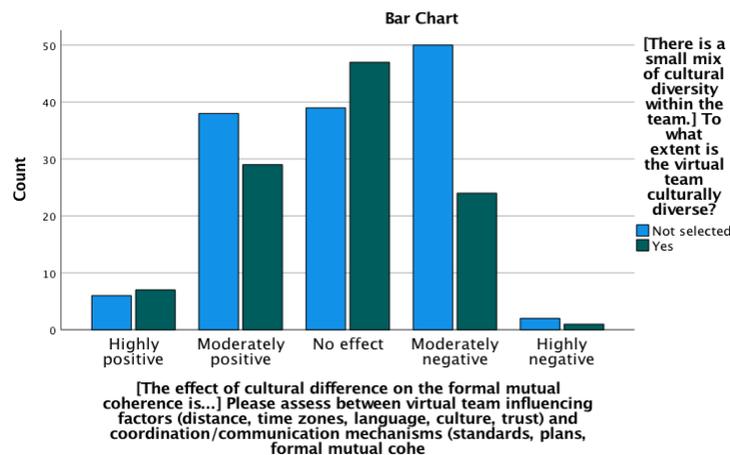
Appendix



No cultural diversity

There is a small mix of cultural diversity within the team

To understand the impact if there is a small mix of cultural diversity within the team, on the effectiveness of the formal mutual coherence, Chi-square test was conducted. Frequencies were not significantly different, $X^2(4, N = 243) = 8.605$, $p = .072$, and if there is a small mix of cultural diversity within the team it has no effect on the formal mutual coherence.

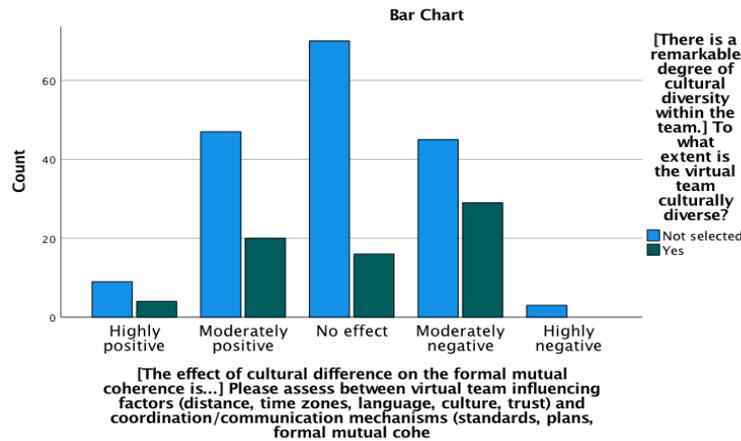


Effect of small mix of cultural diversity on formal mutual coherence

There is a remarkable degree of cultural diversity within the team

To understand the impact if there is a remarkable degree of cultural diversity within the team, on the effectiveness of the formal mutual coherence, Chi-square test was conducted. Frequencies were significantly different, $X^2(4, N = 243) = 9.590$, $p = .048$, and if there is a remarkable degree of cultural diversity within the team it has a moderately negative effect on the formal mutual coherence.

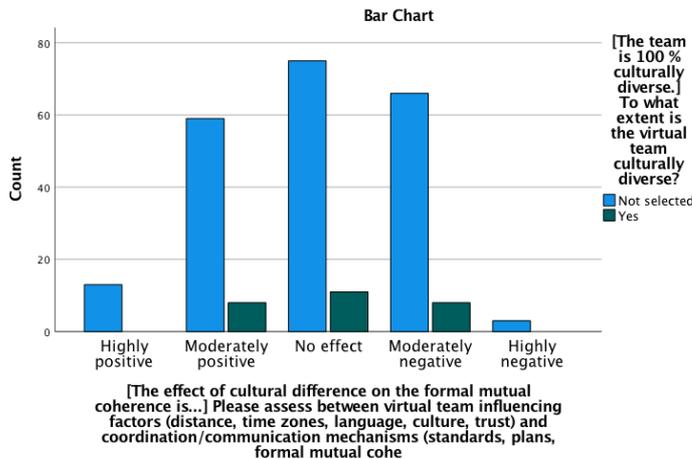
Appendix



Effect of remarkable degree of cultural diversity on formal mutual coherence

The team is 100 % culturally diverse

To understand the impact of 100 % culturally diverse on the effectiveness of the formal mutual coherence, Chi-square test was conducted. Frequencies were not significantly different, $X^2(4, N = 243) = 2.299, p = .681$, and if the team is 100 % culturally diverse, it has no effect on the formal mutual coherence.

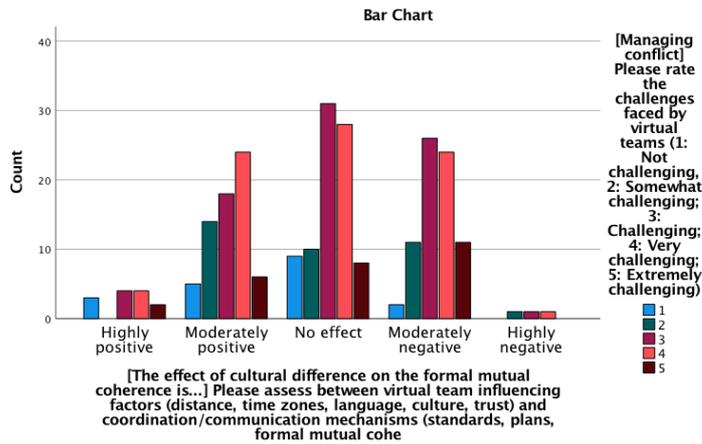


Effect 100 % culturally diversity on formal mutual coherence

Appendix 61. Comparing the Challenges with Hypothesis 17

Managing conflict

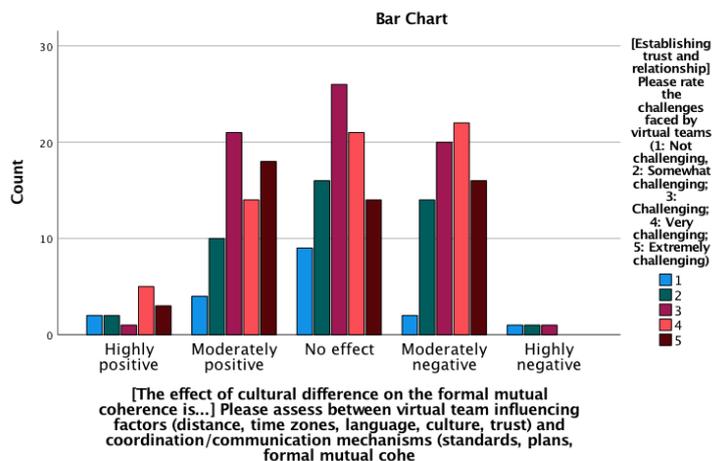
To compare the relation between cultural difference and managing conflict, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and managing conflict, $X^2(16, N = 243) = 15.578, p = .483$, and managing conflict was found challenging (38.8%).



Relation between cultural difference and managing conflict

Establishing trust and relationship

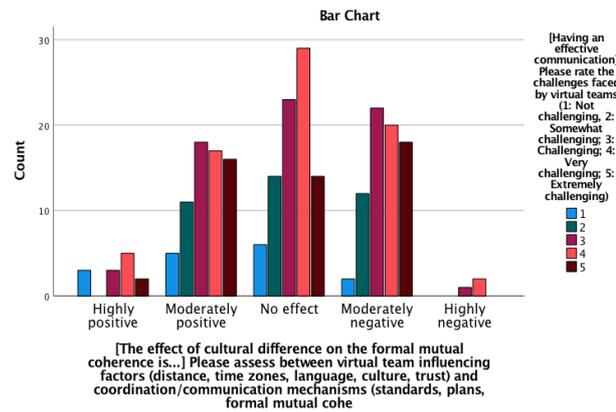
To compare the relation between cultural difference and establishing trust and relationship, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and establishing trust and relationship, $X^2(16, N = 243) = 15.932, p = .458$, and establishing trust and relationship was found challenging (37.7%).



Relation between cultural difference and establishing trust and relationship

Having an effective communication

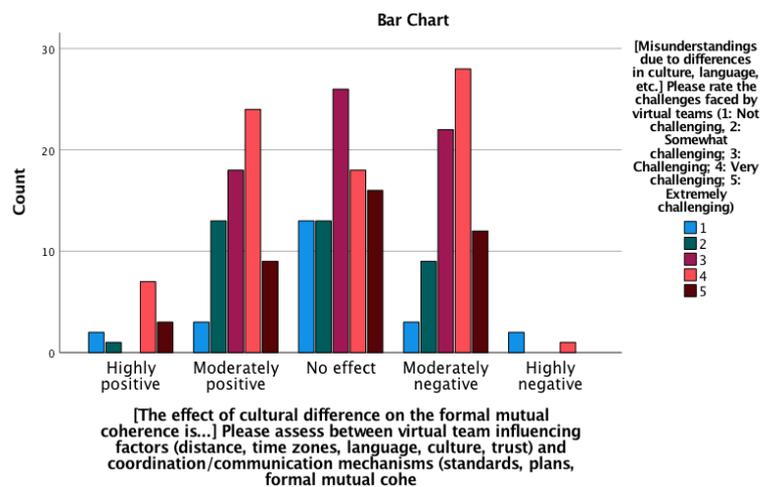
To compare the relation between cultural difference and having an effective communication, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and having an effective communication, $X^2(16, N = 243) = 15.423, p = .494$, and having an effective communication was found very challenging (39.7%).



Relation between cultural difference and effective communication

Misunderstandings due to differences in culture, language

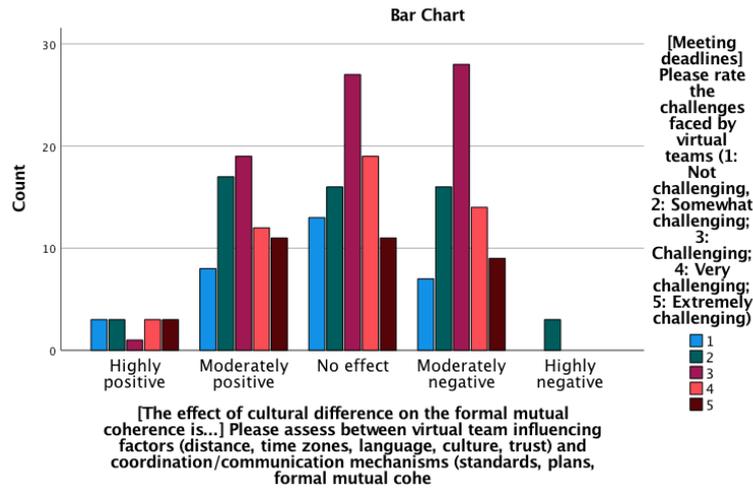
Frequencies were significantly different between cultural difference and misunderstandings due to differences, $X^2(16, N = 243) = 32.592, p = .008$, and misunderstandings due to differences were found very challenging (35.9%).



Relation between cultural difference and misunderstandings

Meeting deadlines

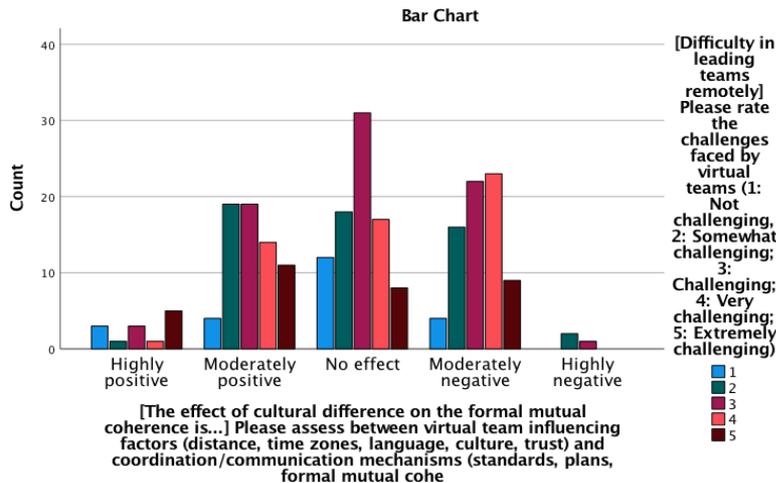
To compare the relation between cultural difference and meeting deadlines, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and meeting deadlines, $X^2(16, N = 243) = 18.593, p = .290$, and meeting deadlines were found challenging (37.3%).



Relation between cultural difference and meeting deadlines

Difficulty in leading teams remotely

To compare the relation between cultural difference and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 25.515, p = .061$, and difficulty in leading teams remotely was found very challenging (40.8%).

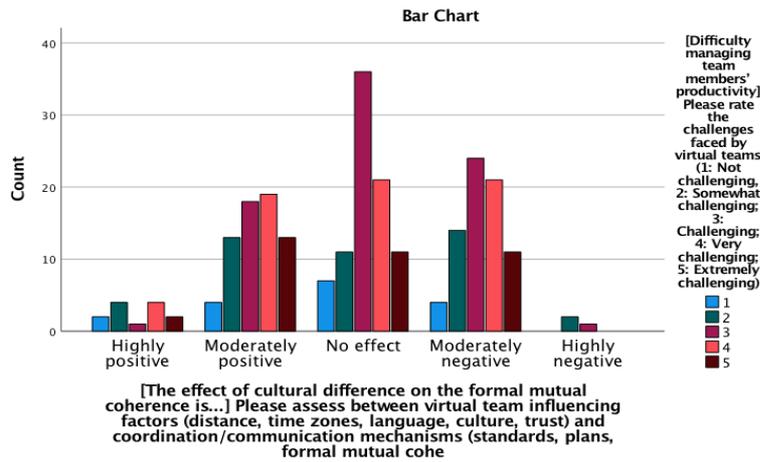


Relation between cultural difference and leading teams remotely

Difficulty managing team members' productivity

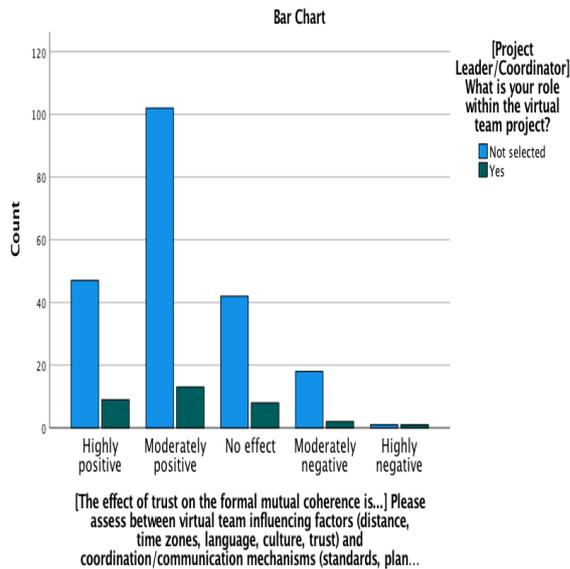
To compare the relation between cultural difference and difficulty managing team members' productivity, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 16.649, p = .409$, and difficulty managing team members' productivity was found very challenging (45.0%).

Appendix

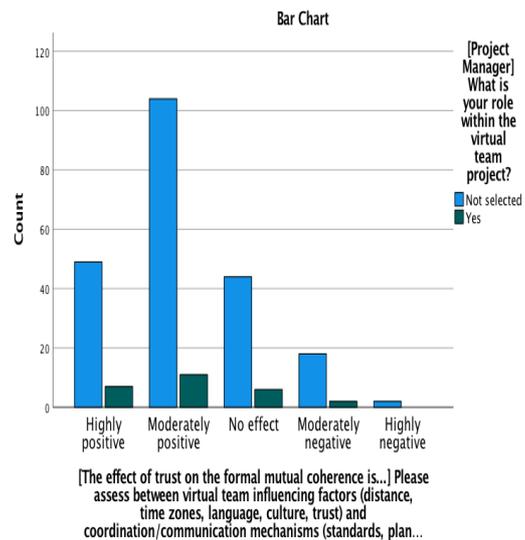


Relation between cultural difference and managing team members' productivity

Appendix 62. Hypothesis 18 and Role Comparison

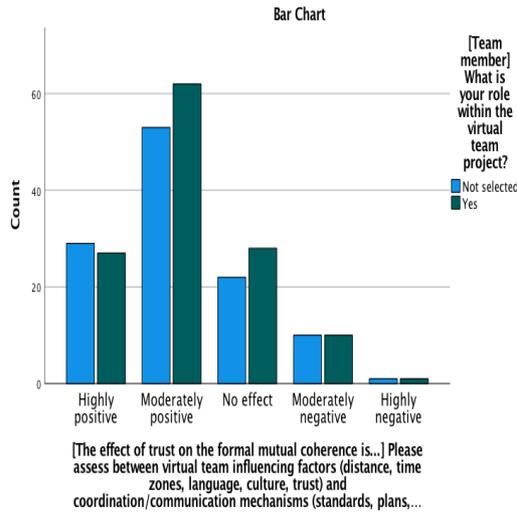


Project Leader/Coordinator

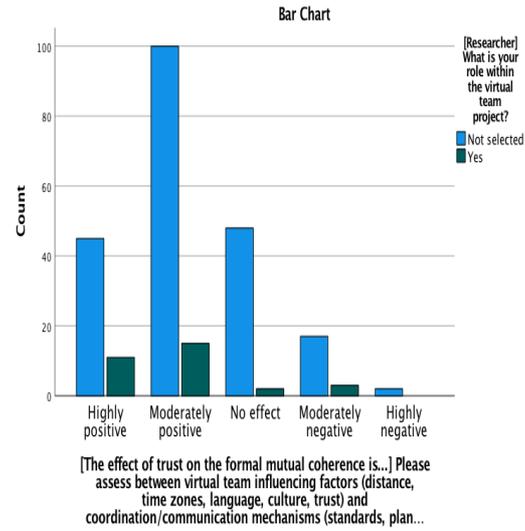


Project Manager

Appendix



Team Member

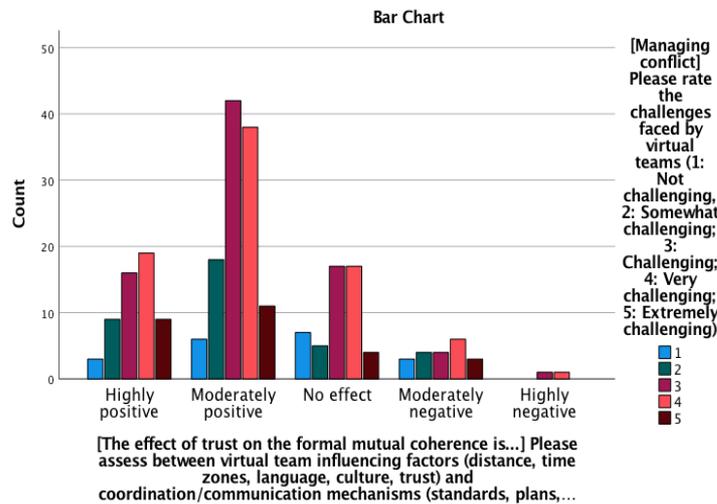


Researcher

Appendix 63. Comparing the Challenges with Hypothesis 18

Managing conflict

To compare the relation between trust and managing conflict, Chi-square test was conducted. Frequencies were not significantly different between trust and managing conflict, $X^2(16, N = 243) = 11.554, p = .774$, and managing conflict was challenging (52.5%).

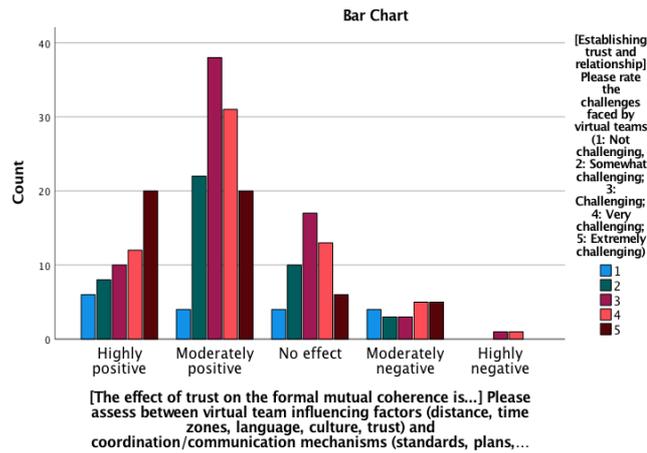


Relation between trust and managing conflict

Establishing trust and relationship

To compare the relation between trust and establishing trust and relationship, Chi-square test was conducted. Frequencies were not significantly different between trust and establishing trust and relationship, $X^2(16, N = 243) = 23.905, p = .092$, and establishing trust and relationship was found challenging (55.1%).

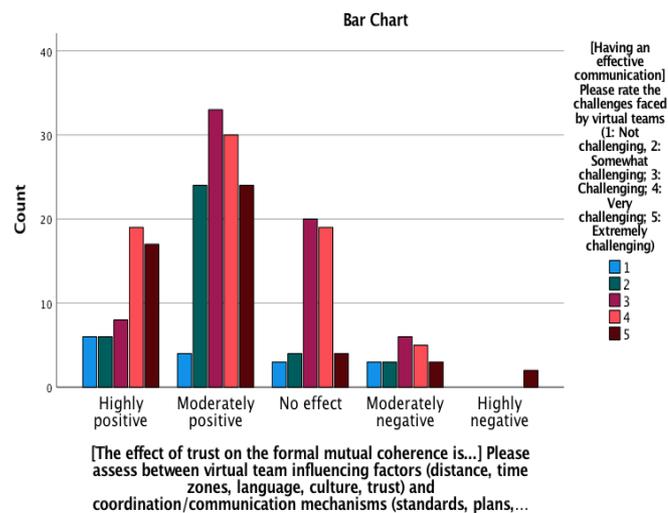
Appendix



Relation between trust and establishing trust and relationship

Having an effective communication

To compare the relation between trust and having an effective communication, Chi-square test was conducted. Frequencies were significantly different between trust and having an effective communication, $X^2(16, N = 243) = 33.242, p = .007$, and having an effective communication was found challenging (49.3%).

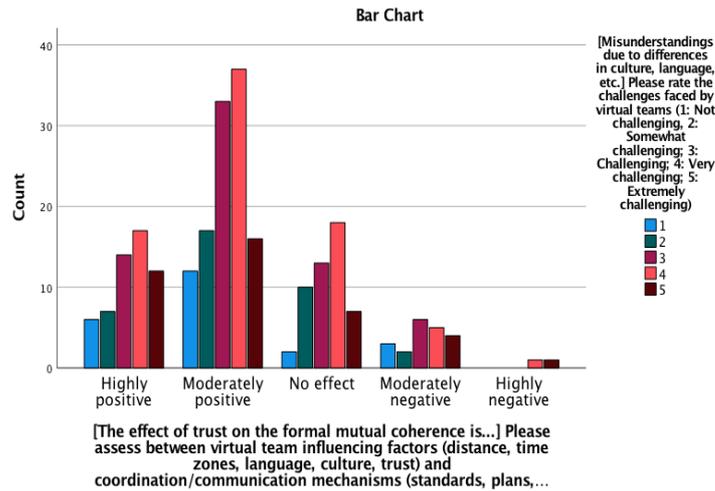


Relation between trust and effective communication

Misunderstandings due to differences in culture, language

To compare the relation between trust and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between trust and misunderstandings due to differences, $X^2(16, N = 243) = 8.963, p = .915$, and misunderstandings due to differences were found very challenging (47.4%).

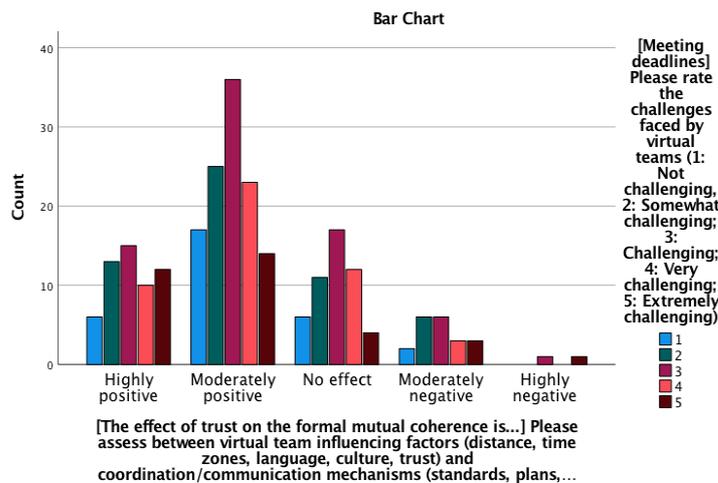
Appendix



Relation between trust and misunderstandings

Meeting deadlines

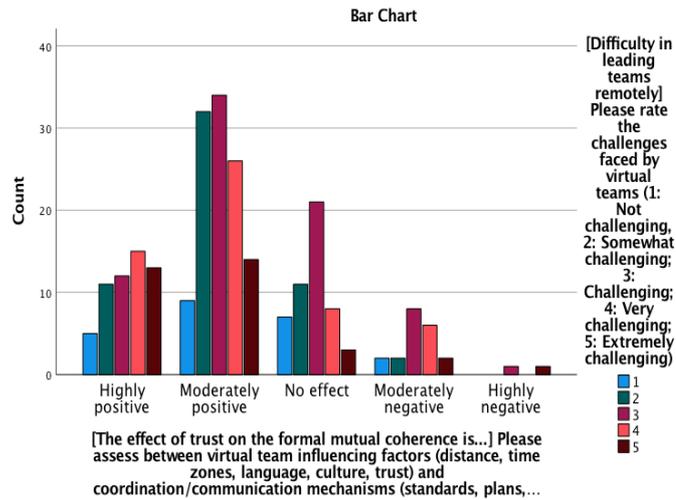
To compare the relation between trust and meeting deadlines, Chi-square test was conducted. Frequencies were not significantly different between trust and meeting deadlines, $X^2(16, N = 243) = 9.472, p = .893$, and meeting deadlines were found challenging (48.0%).



Relation between trust and meeting deadlines

Difficulty in leading teams remotely

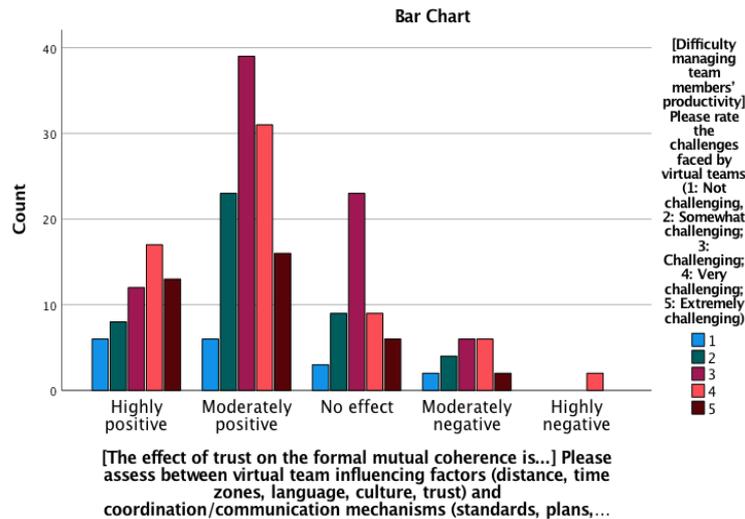
To compare the relation between trust and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were not significantly different between trust and difficulty in leading teams remotely, $X^2(16, N = 243) = 19.985, p = .221$, and difficulty in leading teams remotely was found challenging (44.7%).



Relation between trust and leading teams remotely

Difficulty managing team members’ productivity

To compare the relation between trust and difficulty managing team members’ productivity, Chi-square test was conducted. Frequencies were not significantly different between trust and difficulty managing team members’ productivity, $X^2(16, N = 243) = 18.044, p = .321$, and difficulty managing team members’ productivity was found challenging (48.8%).

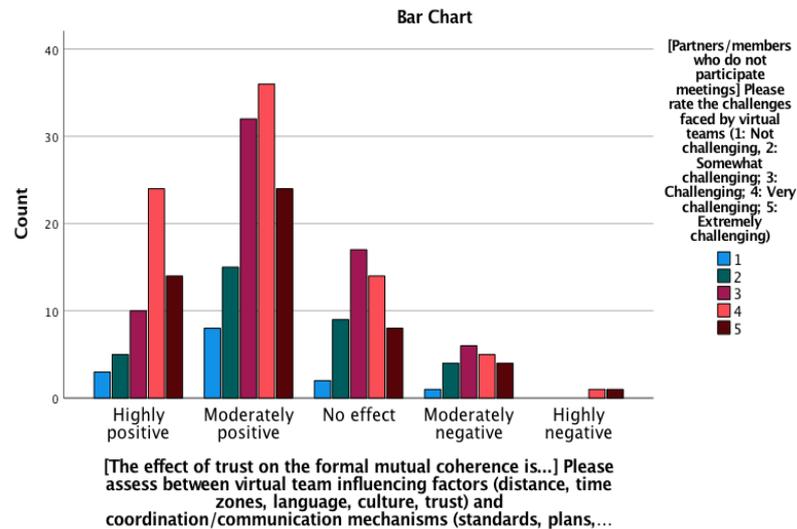


Relation between trust and team members’ productivity

Partners/members who do not participate meetings

To compare the relation between trust and partners/members who do not participate meetings, Chi-square test was conducted. Frequencies were not significantly different between trust and partners/members who do not participate meetings, $X^2(16, N = 243) = 11.053, p = .806$, and partners/members who do not participate meetings were found very challenging (45.0%).

Appendix

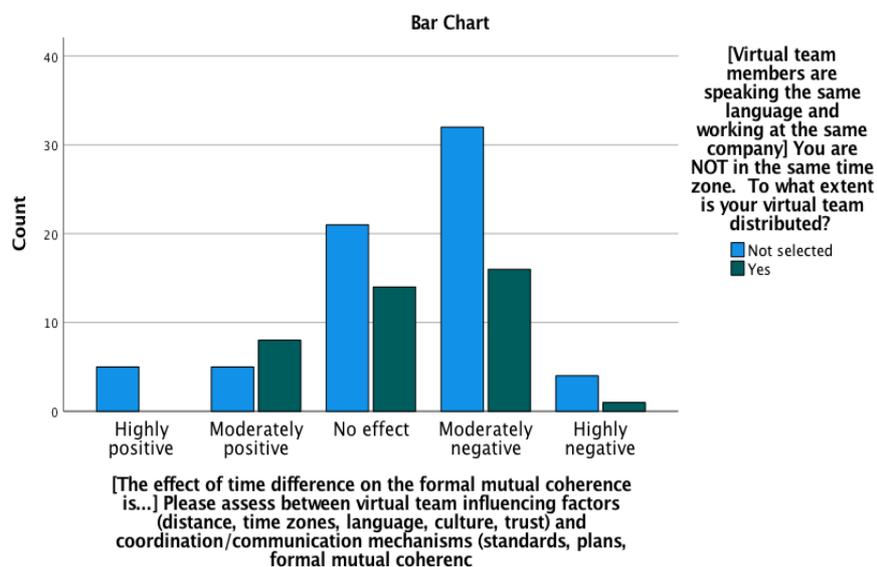


Relation between trust and partners/members who do not participate meetings

Appendix 64. H19 & You are NOT in the same time zone

Virtual team members are speaking the same language and working at the same company

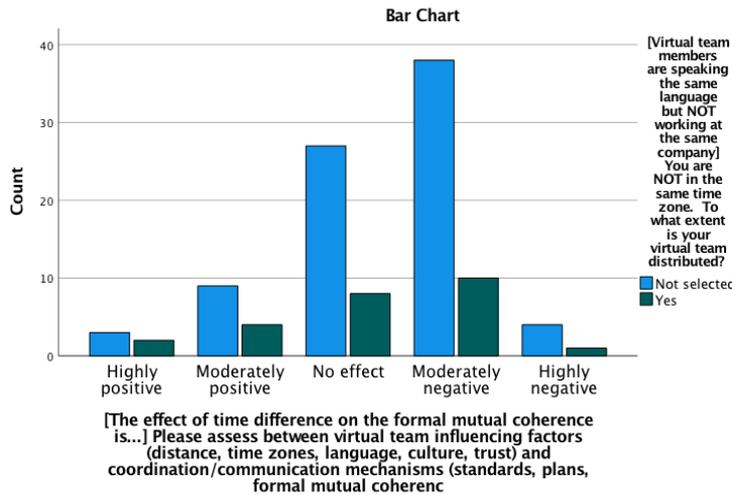
To compare the same language, same company cases, Chi-square test was conducted. There was not a significant difference between the same language and same company cases, $X^2(4, N = 106) = 7.342, p = .119$, virtual team members who are speaking the same language and working at the same company rated that time difference has a moderately negative effect on the formal mutual coherence.



Relationship between same language, same company and formal mutual coherence

Virtual team members are speaking the same language but NOT working at the same company

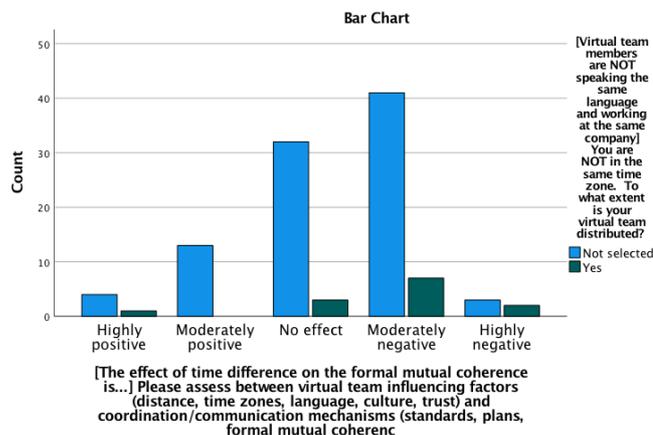
To compare the same language, different company cases, Chi-square test was conducted. There was not a significant difference between the same language and different company cases, $X^2(4, N = 106) = 1.367, p = .850$, virtual team members who are speaking the same language and working at different company rated that time difference has a moderately negative effect on the formal mutual coherence.



Relationship between same language, different company and formal mutual coherence

Virtual team members are NOT speaking the same language and working at the same company

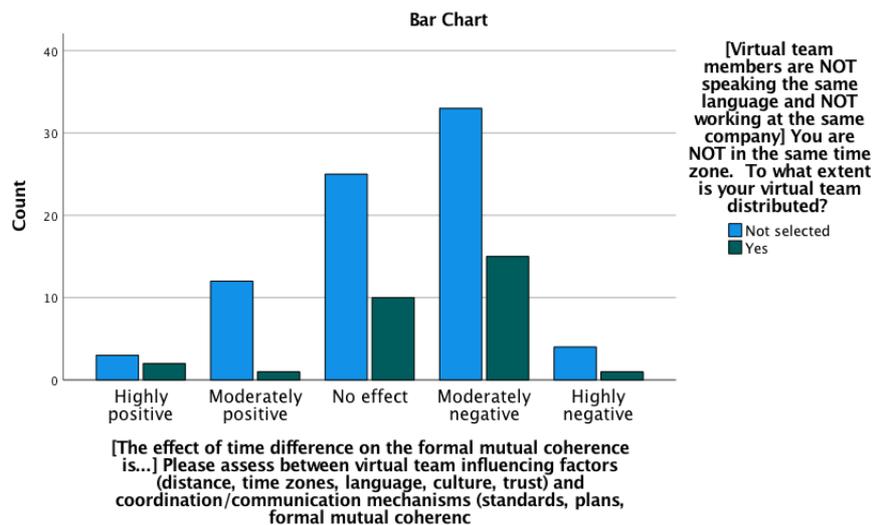
To compare the different language, same company cases, Chi-square test was conducted. There was not a significant difference between the different language and same company cases, $X^2(4, N = 106) = 6.353, p = .174$, virtual team members who are speaking the different language and working at the same company rated that time difference has a moderately negative effect on the formal mutual coherence.



Relationship between different language, same company and formal mutual coherence

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases, Chi-square test was conducted. There was not a significant difference between the different language and different company cases, $X^2(4, N = 106) = 4.460, p = .484$, virtual team members who are speaking the different language and working at different company rated that time difference has a moderately negative effect on the formal mutual coherence.



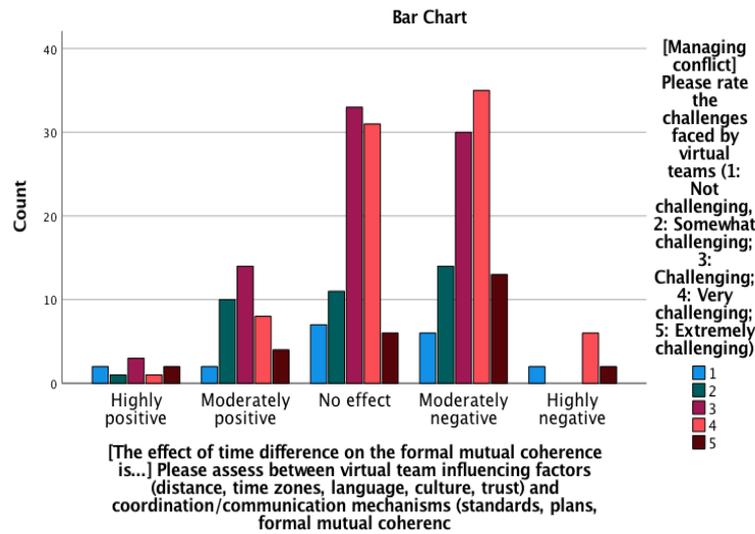
Relationship between different language, different company and formal mutual coherence

Appendix 65. Comparing the Challenges with Hypothesis 19

Managing conflict

To compare the relation between time difference and managing conflict, Chi-square test was conducted. Frequencies were not significantly different between time difference and managing conflict, $X^2(16, N = 243) = 23.488, p = .101$, and managing conflict was found very challenging (35.7%).

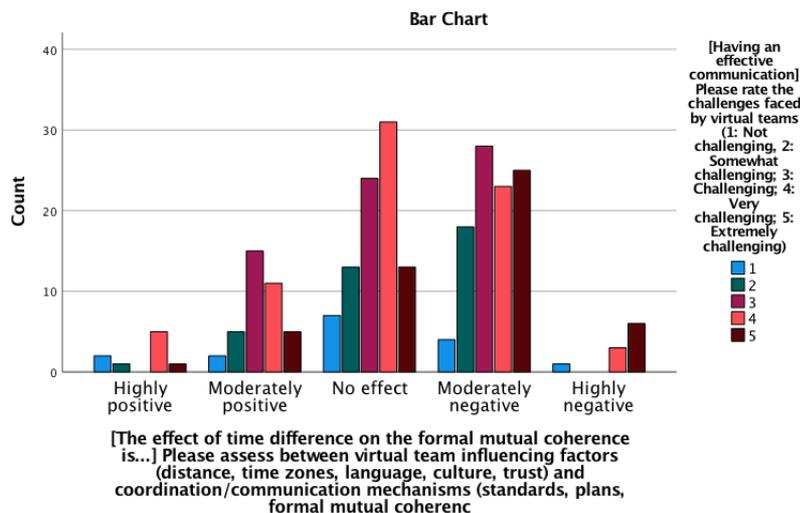
Appendix



Relation between time difference and managing conflict

Having an effective communication

Frequencies were significantly different between time difference and having an effective communication, $X^2(16, N = 243) = 30.133, p = .017$, and having an effective communication was found very challenging (35.2%).



Relation between time difference and effective communication

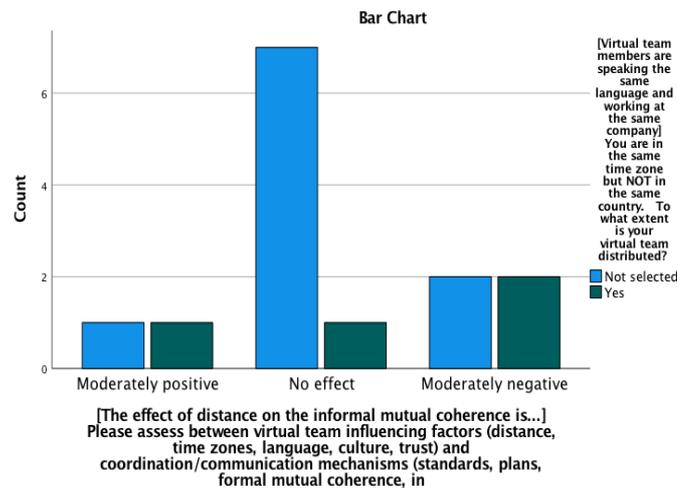
Appendix 66. H20 & You are in the same time zone but NOT in the same country

Virtual team members are speaking the same language and working at the same company

To compare the distance, same language and same company cases, Chi-square test was conducted. There was not a significant difference between distance, same language and same company cases, $X^2(2, N = 14) = 2.363, p = .307$, virtual team members who are speaking the

Appendix

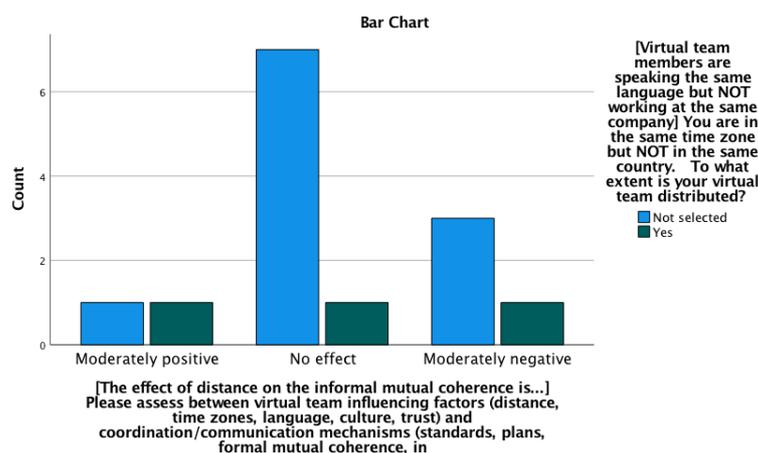
same language and working at the same company rated that distance has a moderately negative effect on the informal mutual coherence.



Relationship between same language, same company and informal mutual coherence

Virtual team members are speaking the same language but NOT working at the same company

To compare the same language, different company and distance cases, Chi-square test was conducted. There was not a significant difference between the same language, different company and distance cases, $X^2(2, N = 14) = 1.379, p = .502$, virtual team members who are speaking the same language and working at different company rated that distance has a moderately negative effect on the informal mutual coherence.



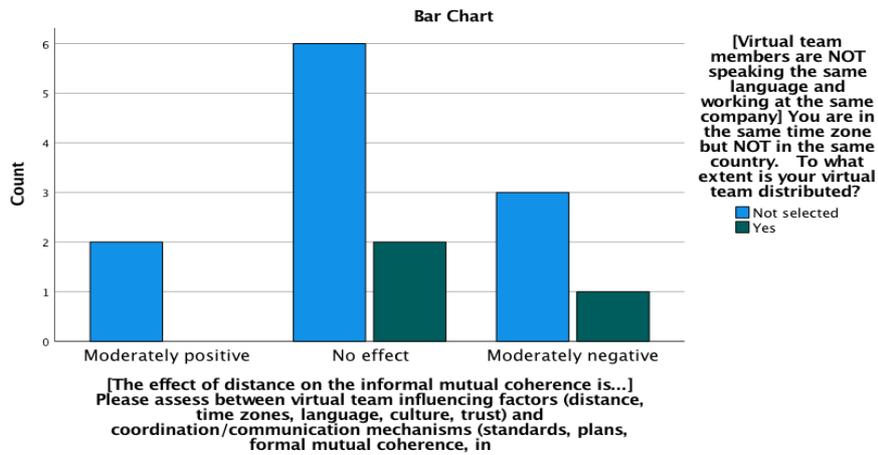
Relationship between same language, different company and informal mutual coherence

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company and distance cases, Chi-square test was conducted. There was not a significant difference between different language, same company and distance cases, $X^2(2, N = 14) = .636, p = .727$, virtual team members who are speaking

Appendix

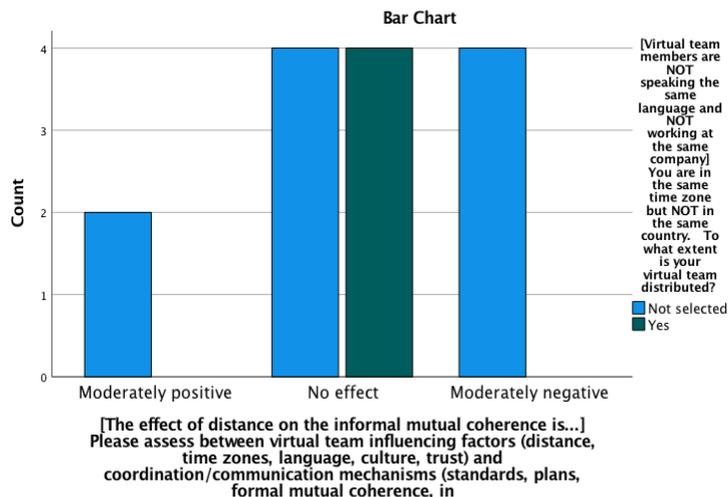
different language and working at the same company rated that distance has no effect on the informal mutual coherence.



Relationship between different language, same company and informal mutual coherence

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company and distance cases, Chi-square test was conducted. There was not a significant difference between different language, different company and distance cases, $X^2(2, N = 14) = 4.200, p = .122$, virtual team members who are speaking different language and working at different company rated that distance has no effect on the informal mutual coherence.

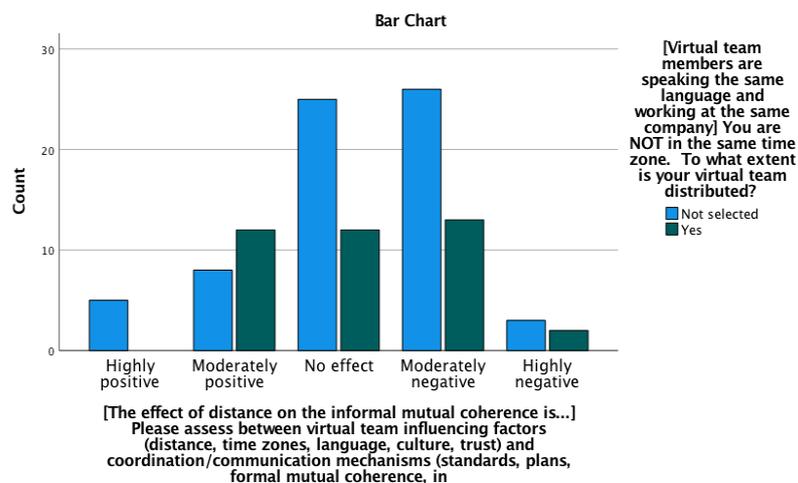


Relationship between different language, different company and informal mutual coherence

Appendix 67. H20 & You are NOT in the same time zone

Virtual team members are speaking the same language and working at the same company

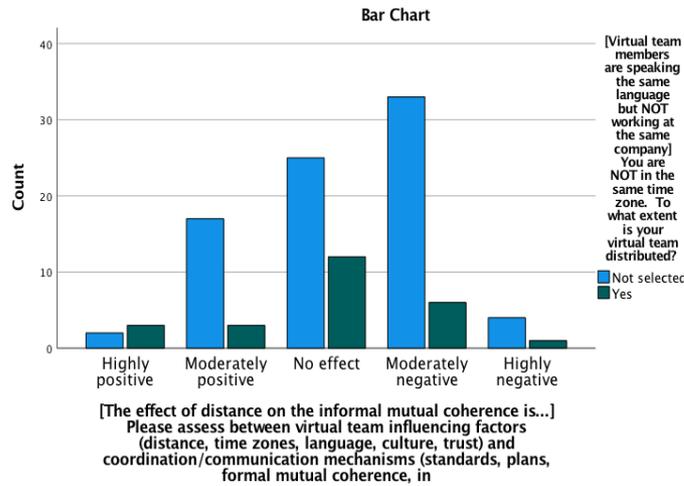
To compare the same language, same company and distance cases, Chi-square test was conducted. There was not a significant difference between same language, same company and distance cases, $X^2(4, N = 106) = 8.068, p = .089$, virtual team members who are speaking same language and working at the same company rated that distance has a moderately negative effect on the informal mutual coherence.



Relationship between same language, same company and informal mutual coherence

Virtual team members are speaking the same language but NOT working at the same company

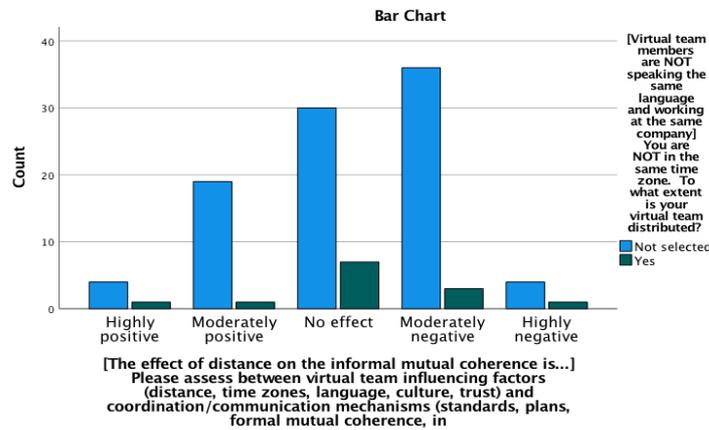
To compare the same language, different company and distance cases, Chi-square test was conducted. There was not a significant difference between same language, different company and distance cases, $X^2(4, N = 106) = 7.595, p = .108$, virtual team members who are speaking same language and working at different company rated that distance has no effect on the informal mutual coherence.



Relationship between same language, different company and informal mutual coherence

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company and distance cases, Chi-square test was conducted. There was not a significant difference between different language, same company and distance cases, $X^2(4, N = 106) = 3.817, p = .431$, virtual team members who are speaking different language and working at the same company rated that distance has no effect on the informal mutual coherence.

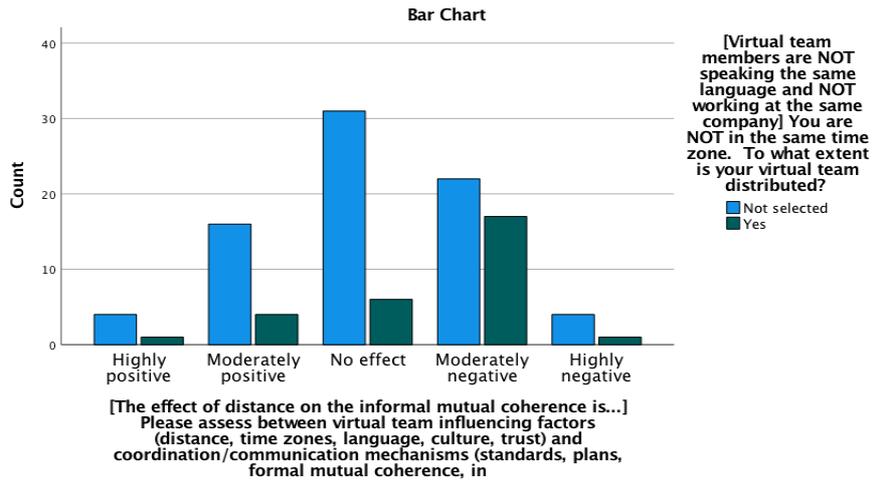


Relationship between different language, same company and informal mutual coherence

Virtual team members are NOT speaking the same language and NOT working at the same company

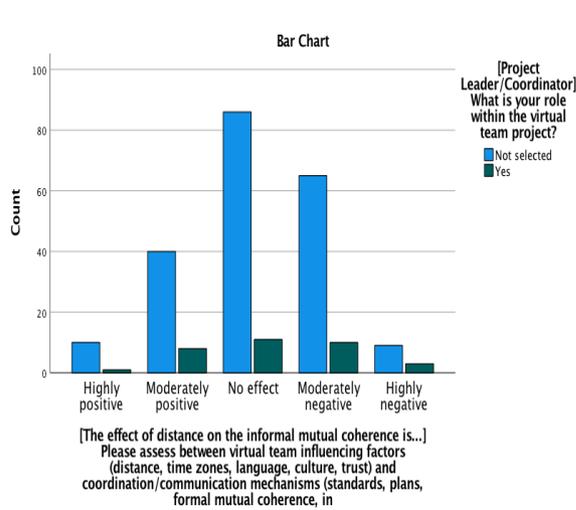
To compare the different language, different company and distance cases, Chi-square test was conducted. There was not a significant difference between different language, different company and distance cases, $X^2(4, N = 106) = 8.299, p = .081$, virtual team members who are speaking different language and working at different company rated that distance has a moderately negative effect on the informal mutual coherence.

Appendix

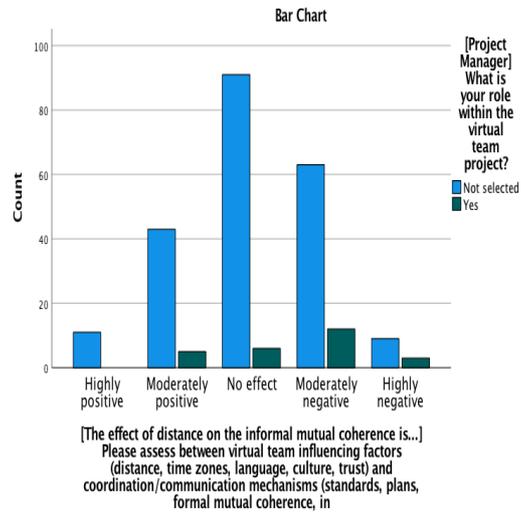


Relationship between different language, different company and informal mutual coherence

Appendix 68. Hypothesis 20 and Role Comparison

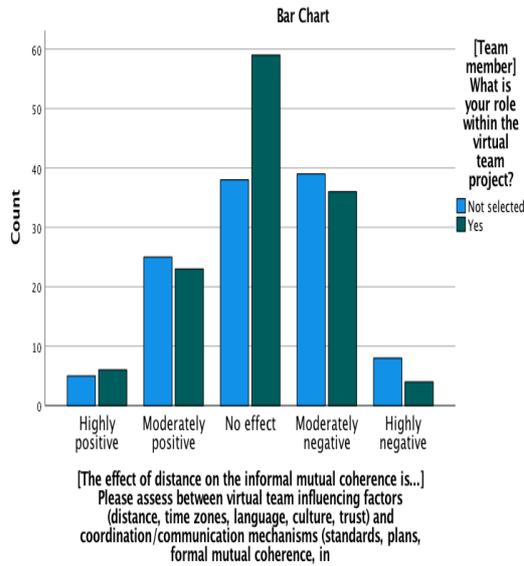


Project Leader/Coordinator

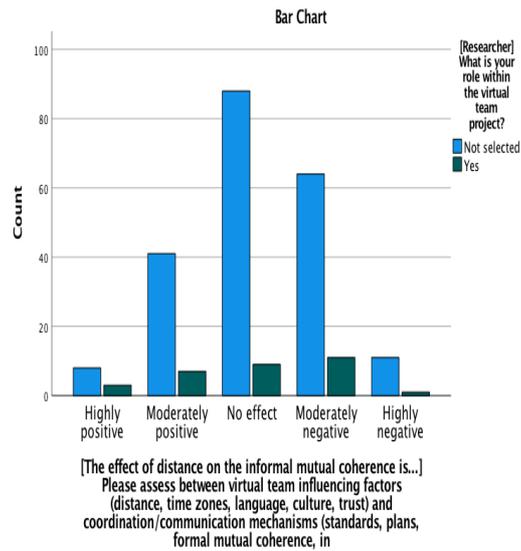


Project Manager

Appendix



Team Member

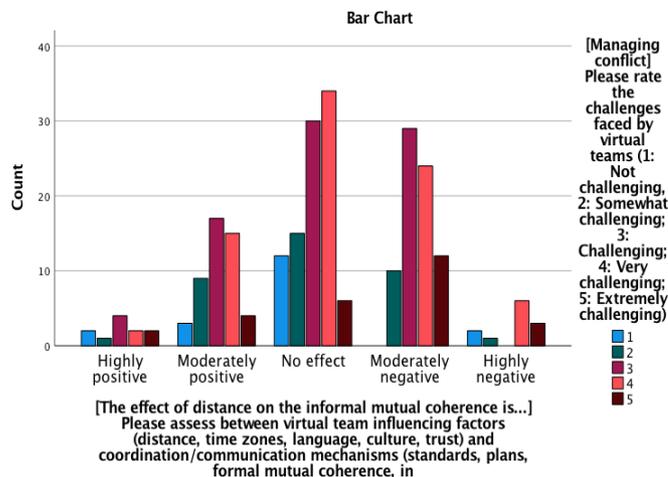


Researcher

Appendix 69. Comparing the Challenges with Hypothesis 20

Managing conflict

To compare the relation between distance and managing conflict, Chi-square test was conducted. Frequencies were not significantly different between distance and managing conflict, $X^2(16, N = 243) = 26.061, p = .053$, and managing conflict was found very challenging (35.1%).

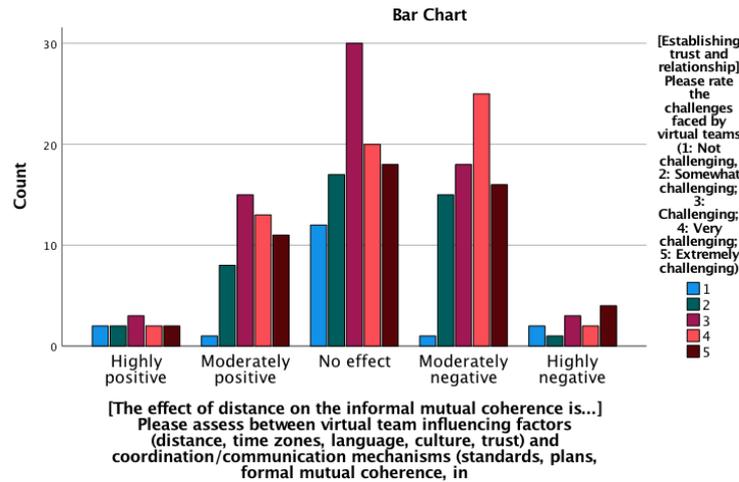


Relation between distance and managing conflict

Establishing trust and relationship

To compare the relation between distance and establishing trust and relationship, Chi-square test was conducted. Frequencies were not significantly different between distance and establishing trust and relationship, $X^2(16, N = 243) = 18.313, p = .306$, and establishing trust and relationship was found challenging (30.9%).

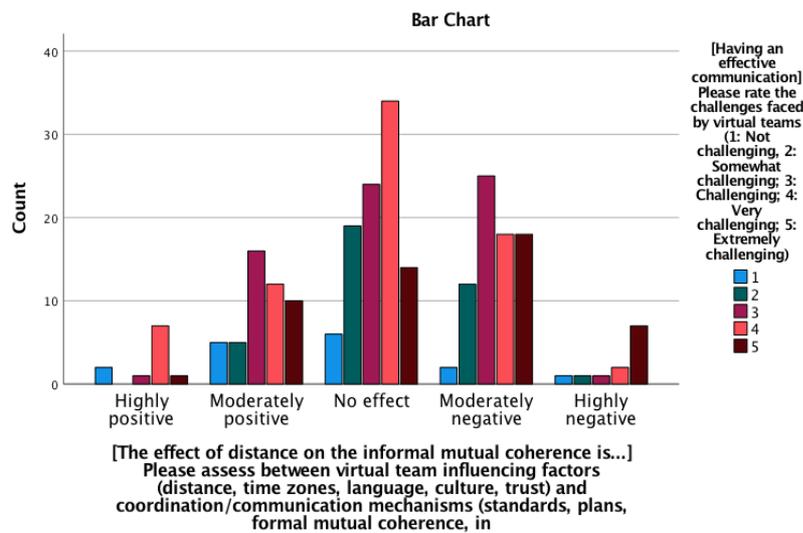
Appendix



Relation between distance and establishing trust and relationship

Having an effective communication

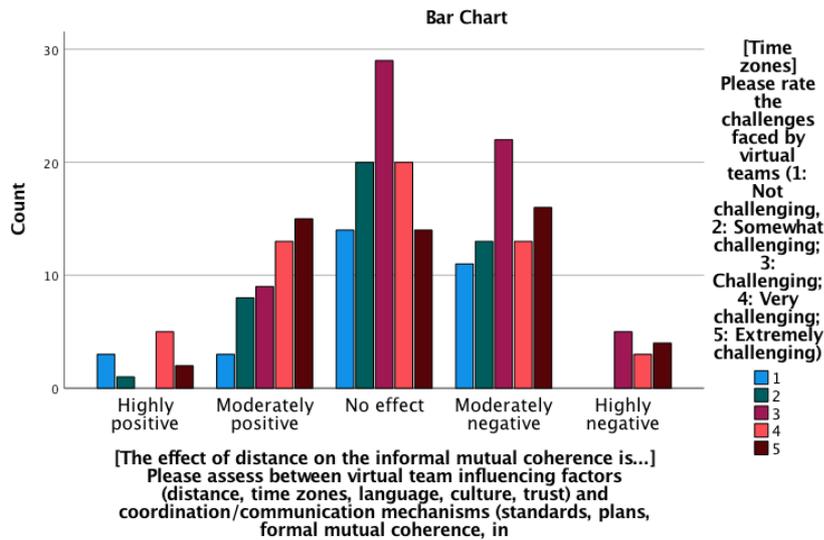
Frequencies were significantly different between distance and having an effective communication, $X^2(16, N = 243) = 32.103, p = .010$, and having an effective communication was found very challenging (35.1%).



Relation between distance and effective communication

Time zones

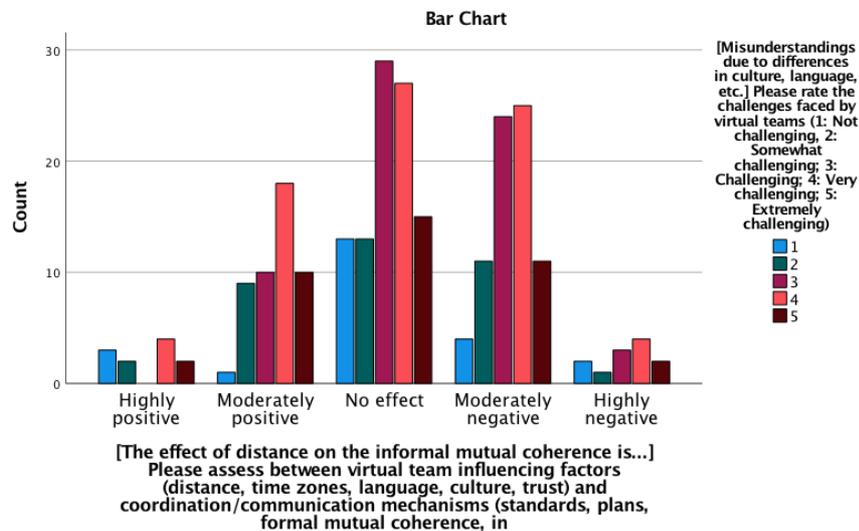
To compare the relation between distance and time zones, Chi-square test was conducted. Frequencies were not significantly different between distance and time zones, $X^2(16, N = 243) = 23.594, p = .099$, and time zones were found challenging (29.9%).



Relation between distance and time zones

Misunderstandings due to differences in culture, language

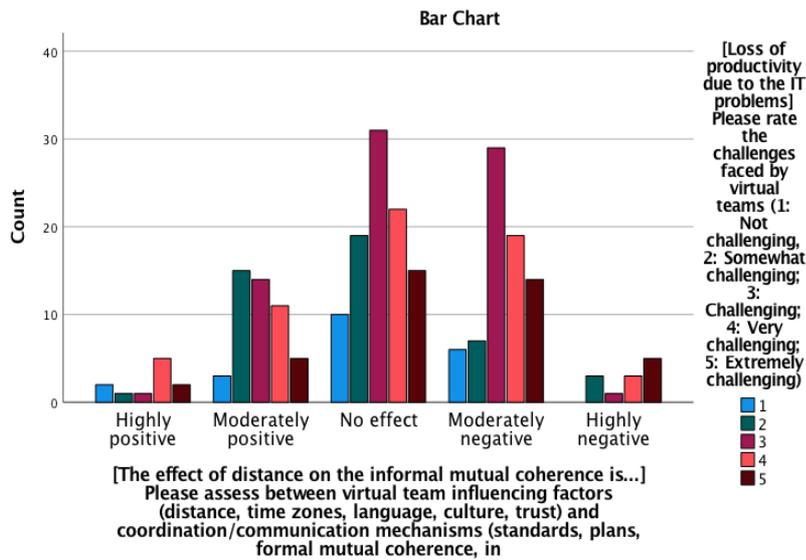
To compare the relation between distance and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between distance and misunderstandings due to differences, $X^2(16, N = 243) = 17.607, p = .347$, and misunderstandings due to differences were found challenging (29.9%).



Relation between distance and misunderstandings

Loss of productivity due to the IT problems

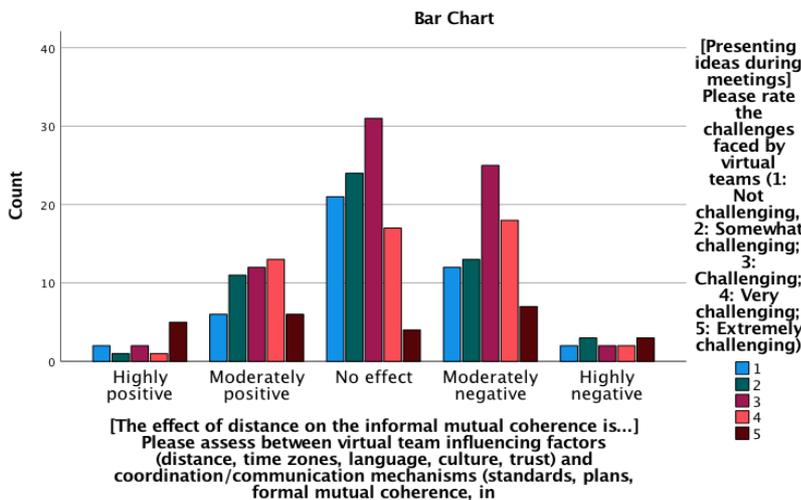
To compare the relation between distance and loss of productivity due to the IT problems, Chi-square test was conducted. Frequencies were not significantly different between distance and loss of productivity due to the IT problems, $X^2(16, N = 243) = 24.462, p = .080$, and loss of productivity due to the IT problems were found challenging (32.0%).



Relation between distance and loss of productivity due to the IT problems

Presenting ideas during meetings

Frequencies were significantly different between distance and presenting ideas during meetings, $X^2(16, N = 243) = 27.949, p = .032$, and presenting ideas during meetings were found challenging (32.0%).

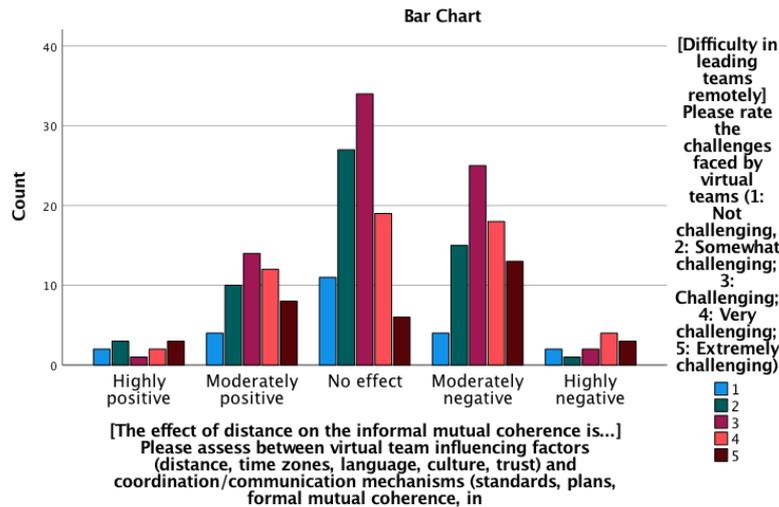


Relation between distance and presenting ideas

Difficulty in leading teams remotely

To compare the relation between distance and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were not significantly different between distance and difficulty in leading teams remotely, $X^2(16, N = 243) = 18.035, p = .322$, and difficulty in leading teams remotely was found challenging (35.1%).

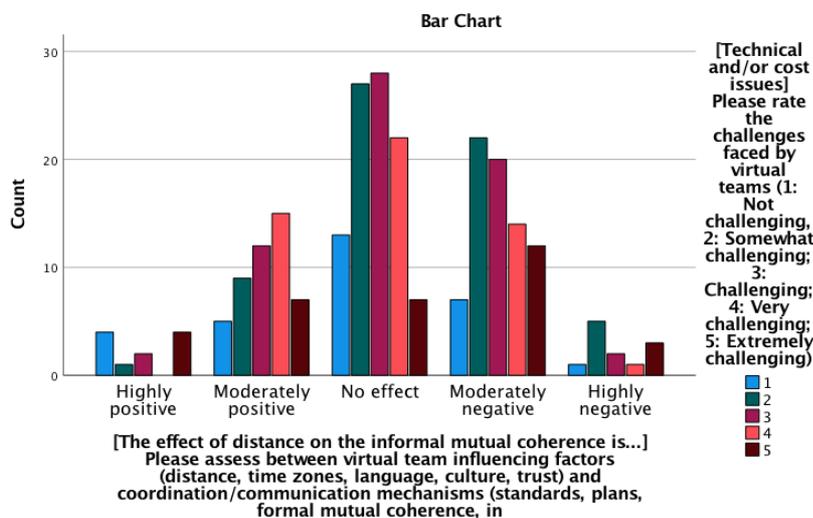
Appendix



Relation between distance and leading teams remotely

Technical and/or cost issues

To compare the relation between distance and technical and/or cost issues, Chi-square test was conducted. Frequencies were not significantly different between distance and technical and/or cost issues, $X^2(16, N = 243) = 25.188, p = .067$, and technical and/or cost issues were found challenging (28.9%).

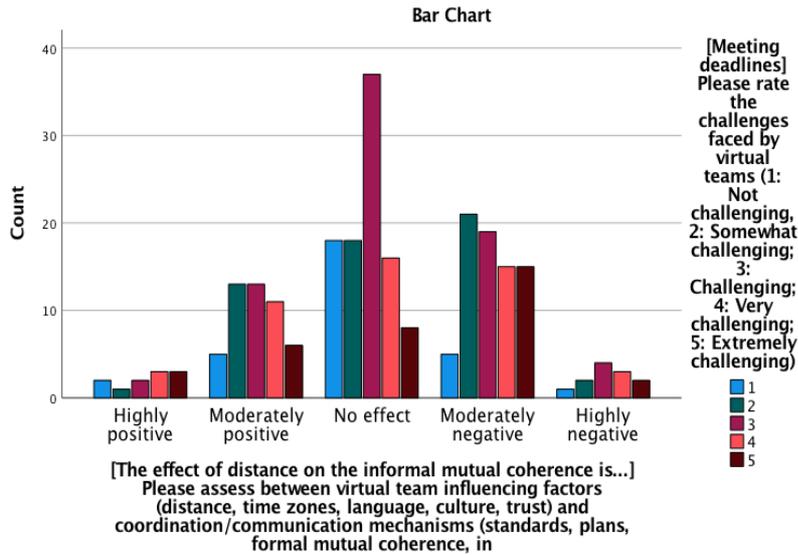


Relation between distance and technical and/or cost issues

Meeting deadlines

To compare the relation between distance and meeting deadlines, Chi-square test was conducted. Frequencies were not significantly different between distance and meeting deadlines, $X^2(16, N = 243) = 18.773, p = .281$, and meeting deadlines were found challenging (38.1%).

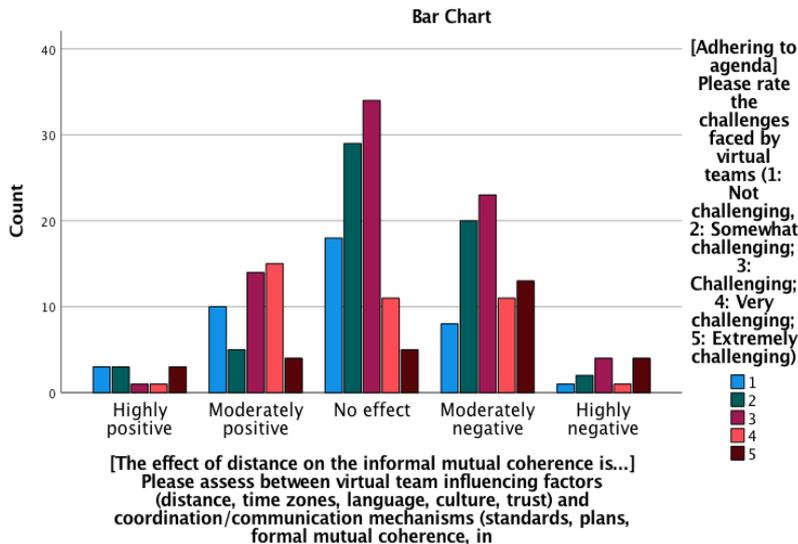
Appendix



Relation between distance and meeting deadlines

Adhering to agenda

Frequencies were significantly different between distance and adhering to agenda, $X^2(16, N = 243) = 33.418, p = .007$, and adhering to agenda was found challenging (35.1%).



Relation between distance and adhering to agenda

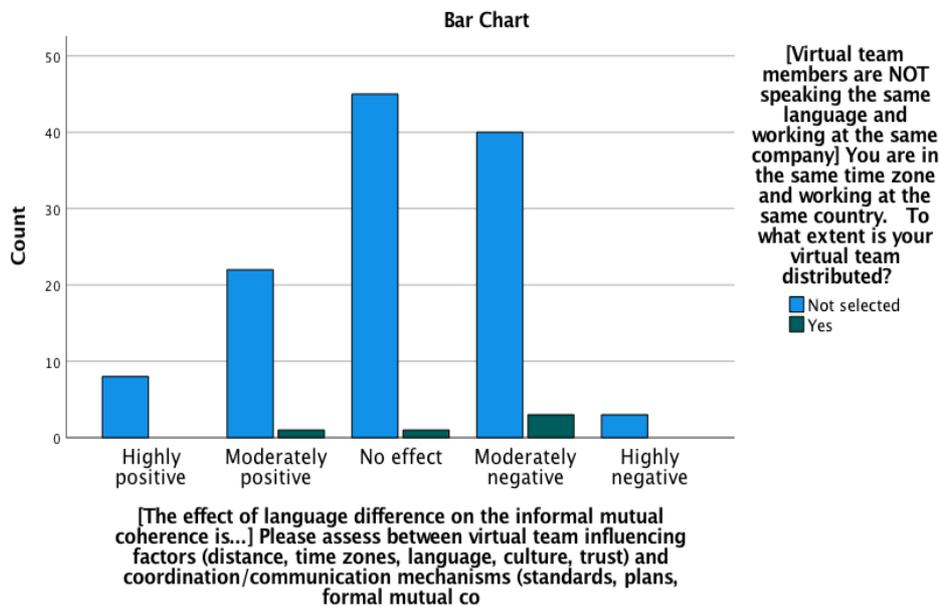
Appendix 70. H21 & You are in the same time zone and working at the same country

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases and language difference, Chi-square test was conducted. There was no significant difference between different language, same

Appendix

company and language difference, $X^2(4, N = 123) = 1.827, p = .767$, virtual team members who are speaking different language and working at the same company rated that language difference has a moderately negative effect on the informal mutual coherence.

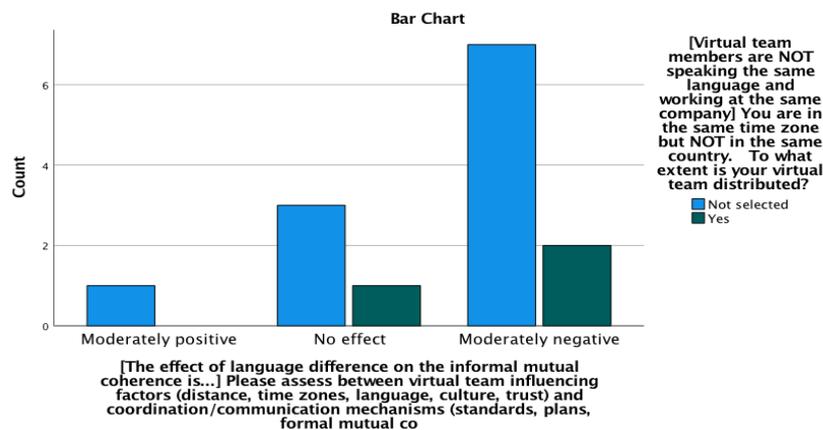


Relationship between different language, same company and informal mutual coherence

Appendix 71. H21 & You are in the same time zone but NOT in the same country

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company cases and language difference, Chi-square test was conducted. There was no significant difference between different language, same company and language difference, $X^2(2, N = 14) = .306, p = .858$, virtual team members who are speaking different language and working at the same company rated that language difference has a moderately negative effect on the informal mutual coherence.

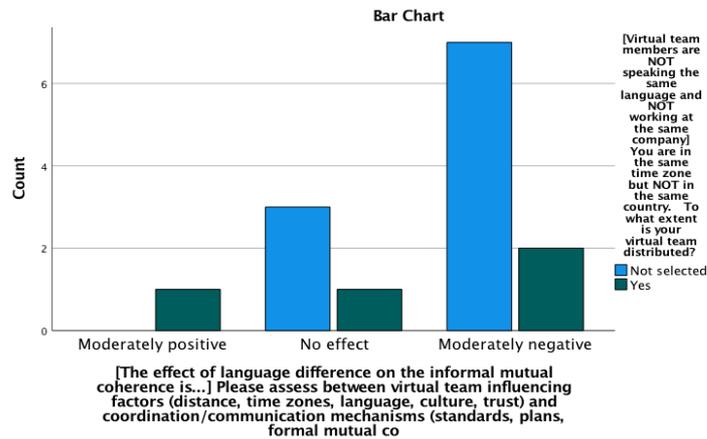


Relationship between different language, same company and informal mutual coherence

Appendix

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company cases and language difference, Chi-square test was conducted. There was no significant difference between different language, different company and language difference, $X^2(2, N = 14) = 2.703, p = .259$, virtual team members who are speaking different language and working at different company rated that language difference has a moderately negative effect on the informal mutual coherence.



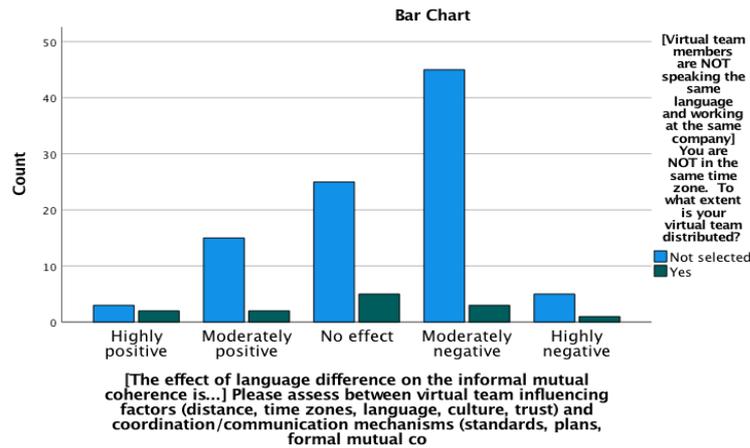
Relationship between different language, different company and informal mutual coherence

Appendix 72. H21 & You are NOT in the same time zone

Virtual team members are NOT speaking the same language and working at the same company

To compare the same company and language difference, Chi-square test was conducted. There was no significant difference between different language and the same company, $X^2(4, N = 106) = 5.841, p = .211$, virtual team members who are speaking different language and working at the same company rated that language difference has no effect on the informal mutual coherence.

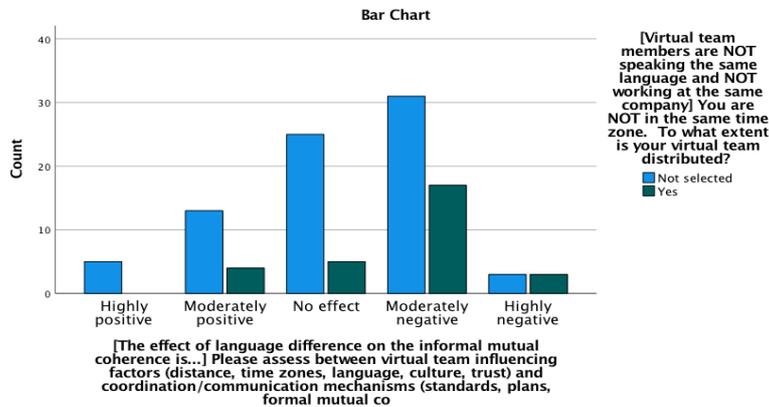
Appendix



Relationship between same company, different language and informal mutual coherence

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company and language difference, Chi-square test was conducted. There was no significant difference between different language and the different company, $X^2(4, N = 106) = 6.850, p = .144$, virtual team members who are speaking different language and working at different company rated that language difference has a moderately negative effect on the informal mutual coherence.



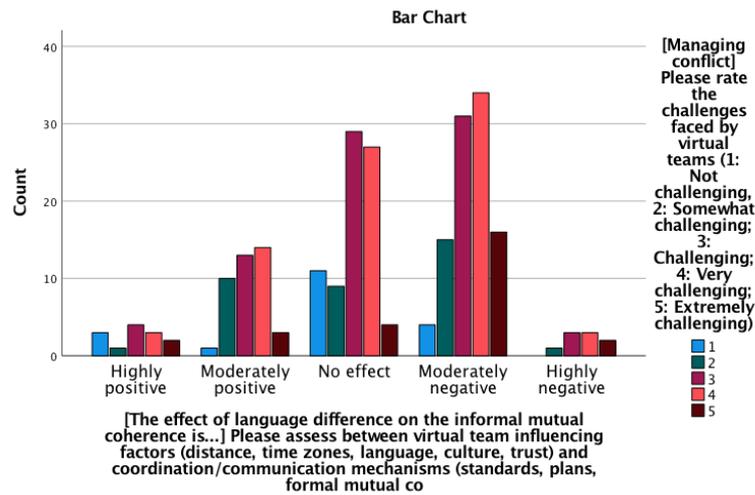
Relationship between different language, different company and informal mutual coherence

Appendix 73. Comparing the Challenges with Hypothesis 21

Managing conflict

To compare the relation between language difference and managing conflict, Chi-square test was conducted. Frequencies were not significantly different between language difference and managing conflict, $X^2(16, N = 243) = 22.750, p = .121$, and managing conflict was found very challenging (34.0%).

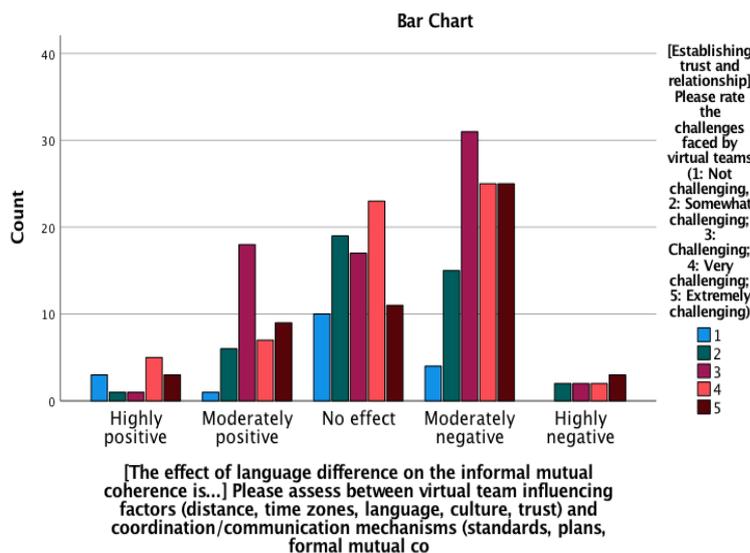
Appendix



Relation between language difference and managing conflict

Establishing trust and relationship

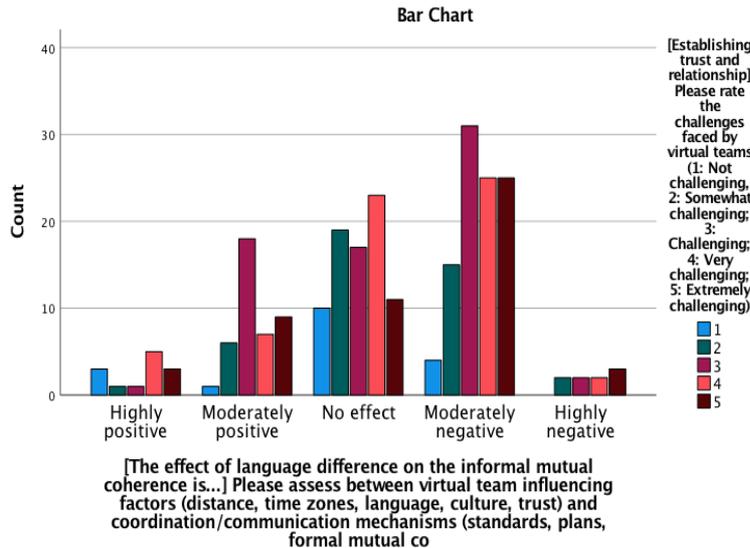
Frequencies were significantly different between language difference and establishing trust and relationship, $X^2(16, N = 243) = 26.906, p = .043$, and establishing trust and relationship was found challenging (31.0%).



Relation between language difference and establishing trust and relationship

Establishing trust and relationship

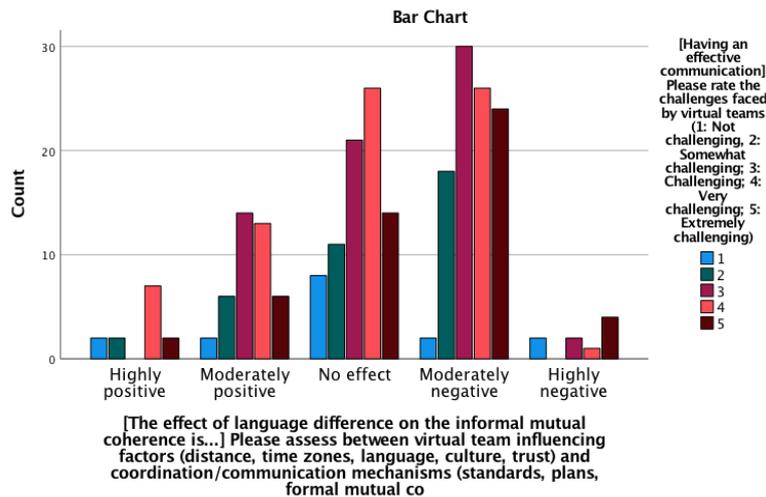
To compare the relation between language difference and establishing trust and relationship, Chi-square test was conducted. Frequencies were significantly different between language difference and establishing trust and relationship, $X^2(16, N = 243) = 26.906, p = .043$, and establishing trust and relationship was found challenging (31.0%).



Relation between language difference and establishing trust and relationship

Having an effective communication

To compare the relation between language difference and having an effective communication, Chi-square test was conducted. Frequencies were not significantly different between language difference and having an effective communication, $X^2(16, N = 243) = 24.819, p = .073$, and having an effective communication was found challenging (30.0%).

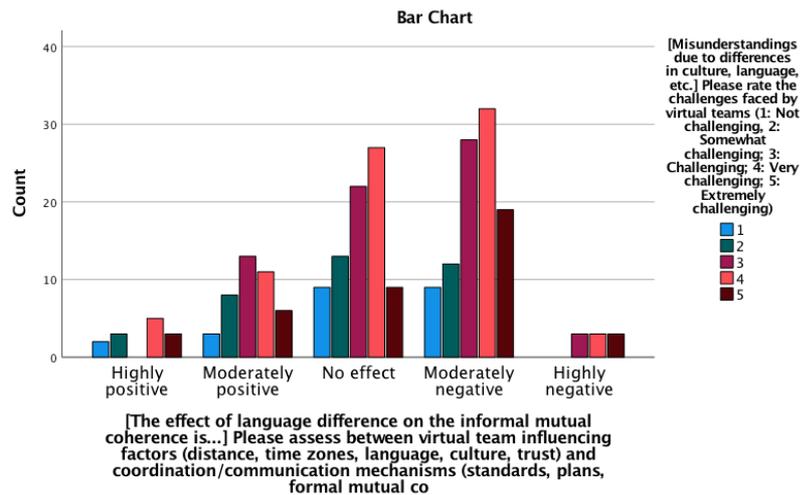


Relation between language difference and effective communication

Misunderstandings due to differences in culture, language

To compare the relation between language difference and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between language difference and misunderstandings due to differences, $X^2(16, N = 243) = 13.301, p = .651$, and misunderstandings due to differences were found very challenging (32.0%).

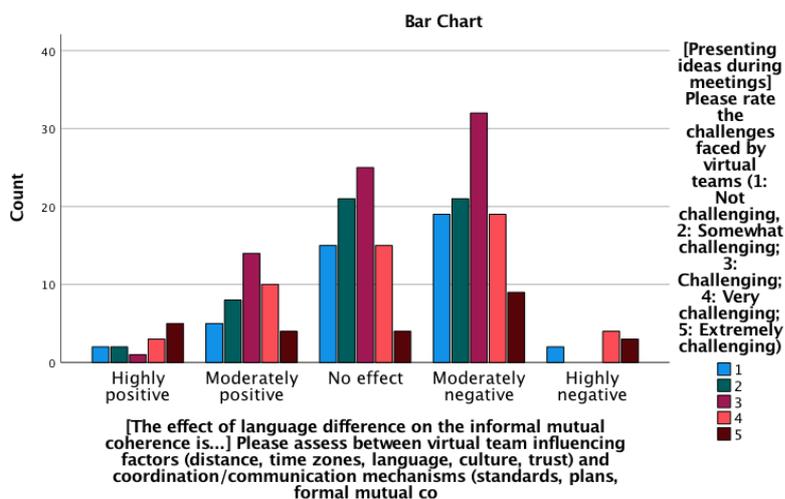
Appendix



Relation between language difference and misunderstandings

Presenting ideas during meetings

Frequencies were significantly different between language difference and presenting ideas during meetings, $X^2(16, N = 243) = 29.427, p = .021$, and presenting ideas during meetings were found challenging (32.0%).

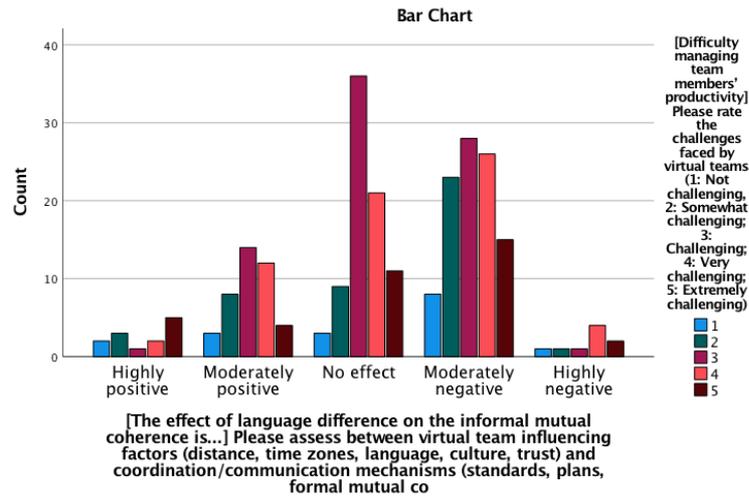


Relation between language difference and presenting ideas

Difficulty managing team members' productivity

To compare the relation between language difference and difficulty managing team members' productivity, Chi-square test was conducted. Frequencies were not significantly different between language difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 22.488, p = .128$, and difficulty managing team members' productivity was found challenging (45.0%).

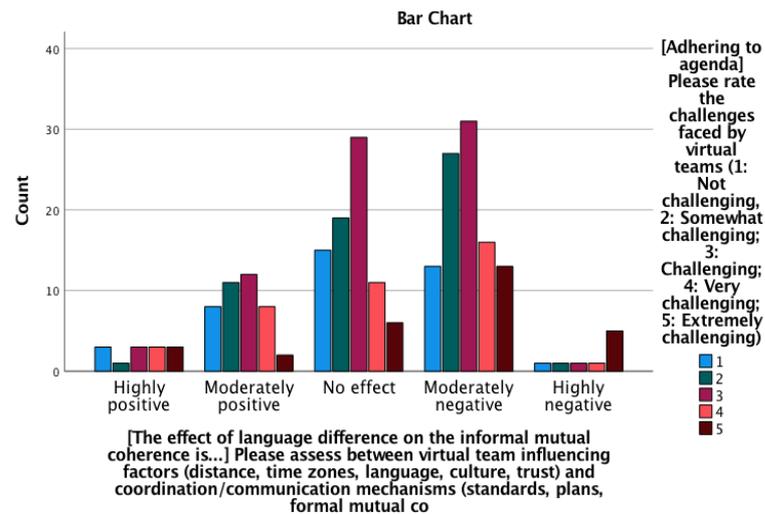
Appendix



Relation between language difference and managing team members' productivity

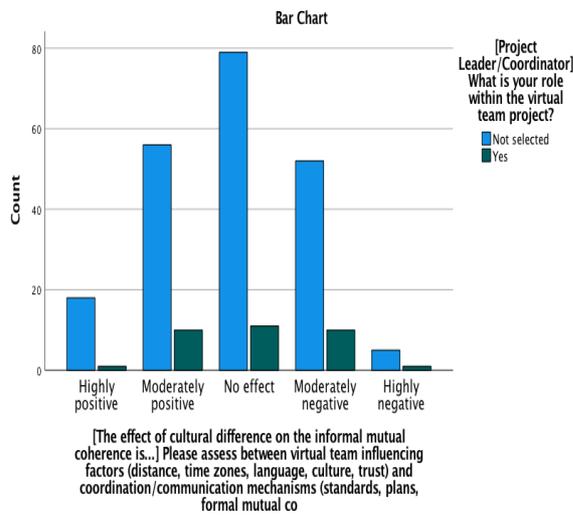
Adhering to agenda

Frequencies were significantly different between language difference and adhering to agenda, $X^2(16, N = 243) = 26.327, p = .050$, and adhering to agenda was found challenging (31.0%).

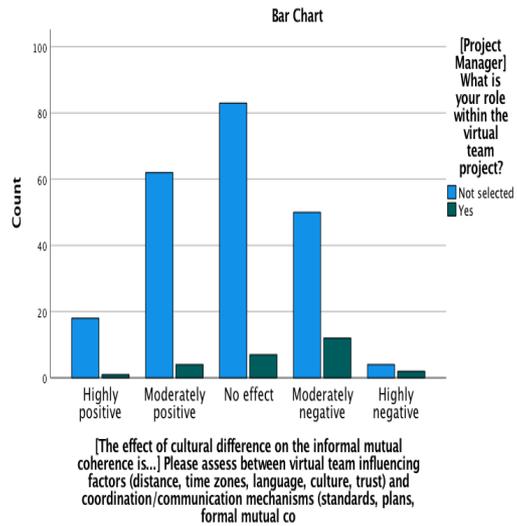


Relation between language difference and adhering to agenda

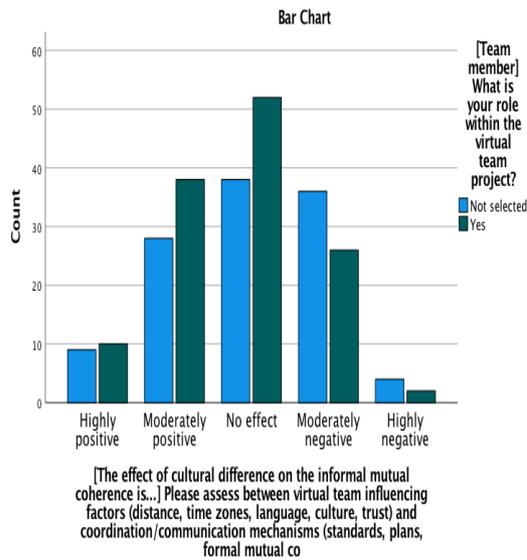
Appendix 74. Hypothesis 22 and Role Comparison



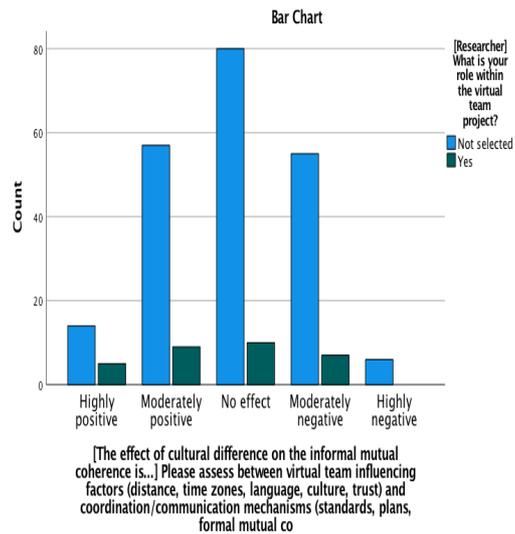
Project Leader/Coordinator



Project Manager



Team Member

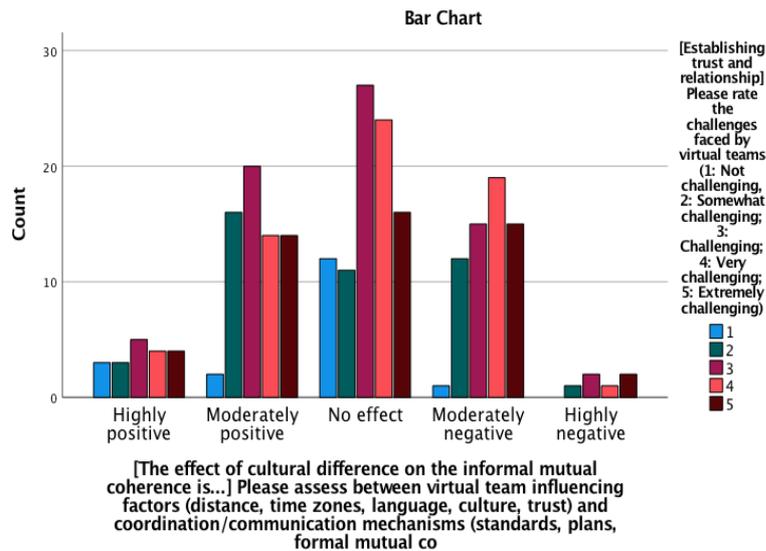


Researcher

Appendix 75. Comparing the Challenges with Hypothesis 22

Establishing trust and relationship

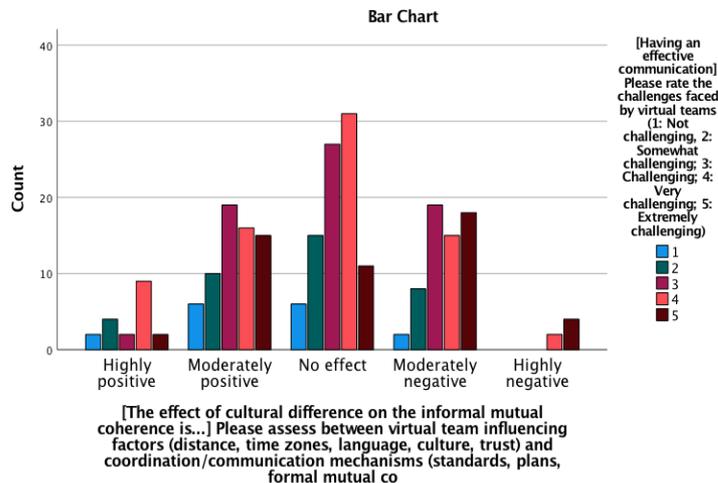
To compare the relation between cultural difference and establishing trust and relationship, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and establishing trust and relationship, $X^2(16, N = 243) = 17.605, p = .348$, and establishing trust and relationship was found challenging (30.0%).



Relation between cultural difference and establishing trust and relationship

Having an effective communication

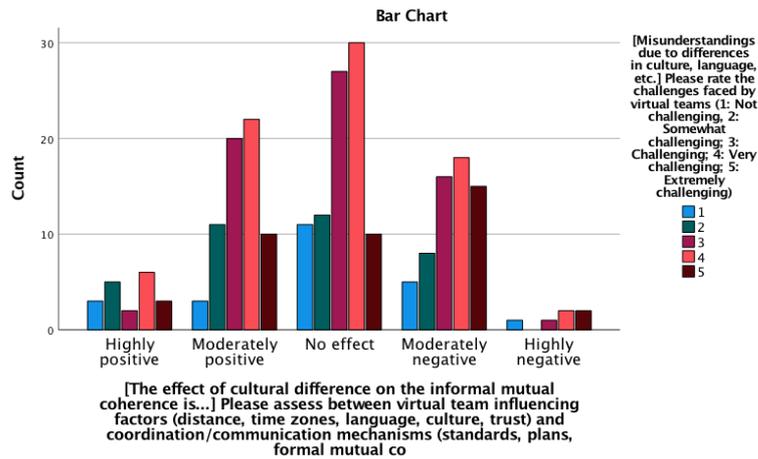
To compare the relation between cultural difference and having an effective communication, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and having an effective communication, $X^2(16, N = 243) = 24.741, p = .075$, and having an effective communication was found very challenging (34.4%).



Relation between cultural difference and effective communication

Misunderstandings due to differences in culture, language

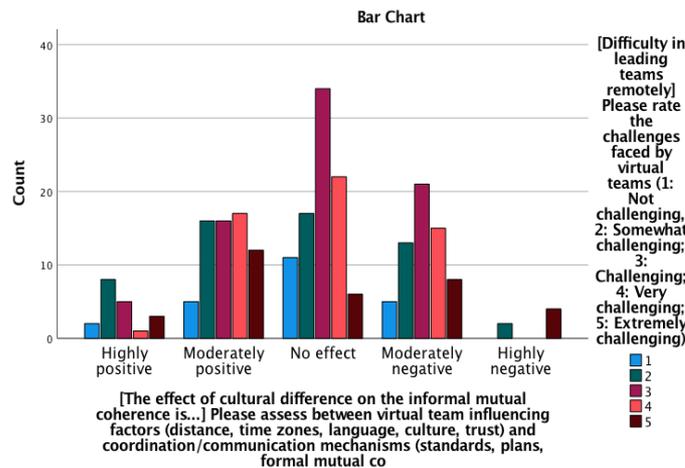
To compare the relation between cultural difference and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and misunderstandings due to differences, $X^2(16, N = 243) = 14.612, p = .553$, and misunderstandings due to differences were found very challenging (33.3%).



Relation between cultural difference and misunderstandings

Difficulty in leading teams remotely

To compare the relation between cultural difference and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were significantly different between cultural difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 31.323, p = .012$, and difficulty in leading teams remotely was found challenging (37.8%).

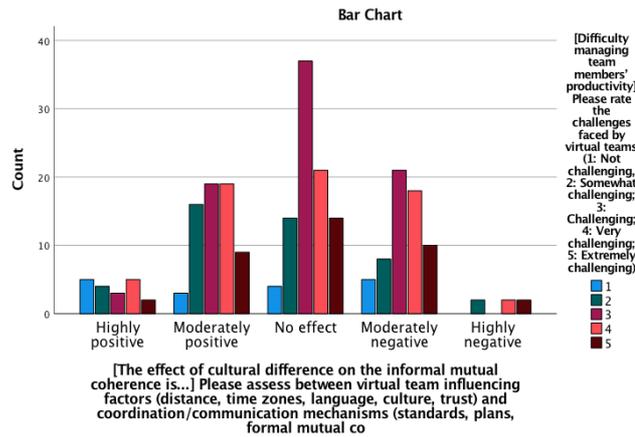


Relation between cultural difference and leading teams remotely

Difficulty managing team members' productivity

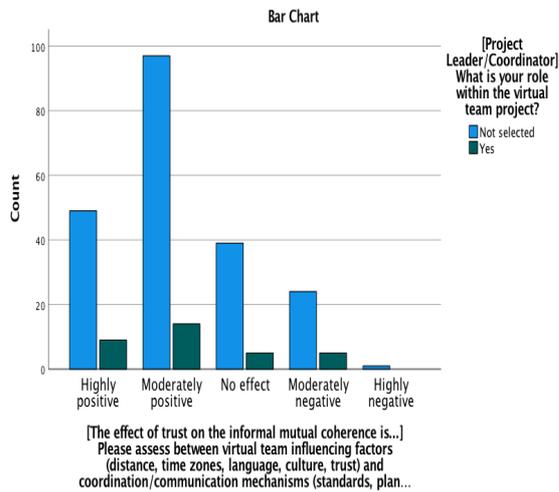
To compare the relation between cultural difference and difficulty managing team members' productivity, Chi-square test was conducted. Frequencies were not significantly different between cultural difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 23.838, p = .093$, and difficulty managing team members' productivity was found challenging (41.1%).

Appendix

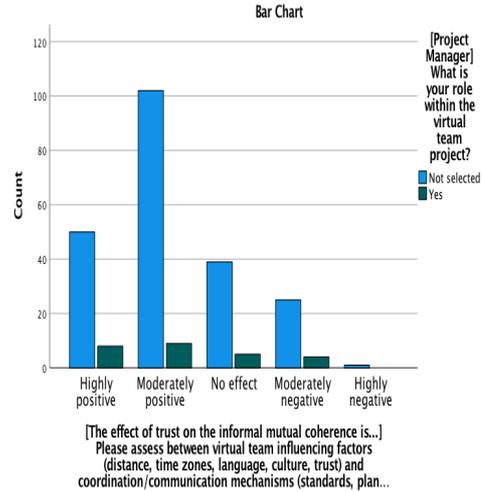


Relation between cultural difference and managing team members' productivity

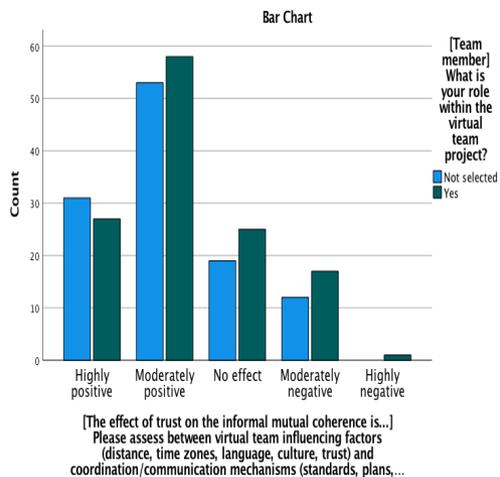
Appendix 76. Hypothesis 23 and Role Comparison



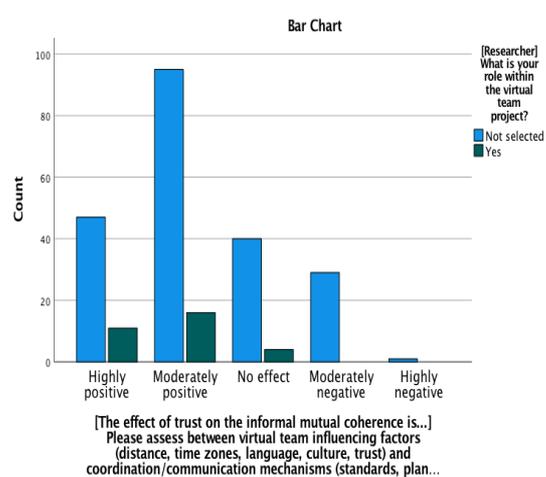
Project Leader/Coordinator



Project Manager



Team Member

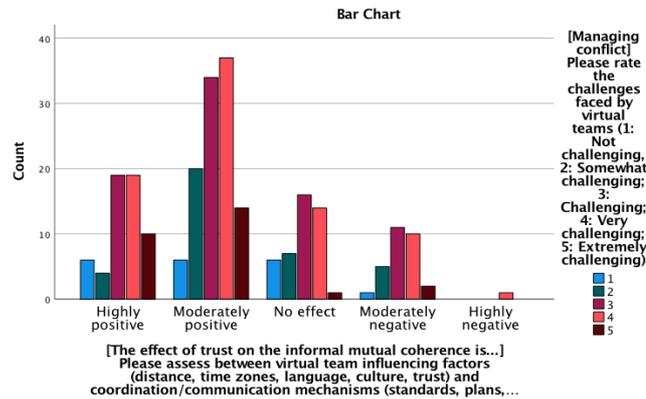


Researcher

Appendix 77. Comparing the Challenges with Hypothesis 23

Managing conflict

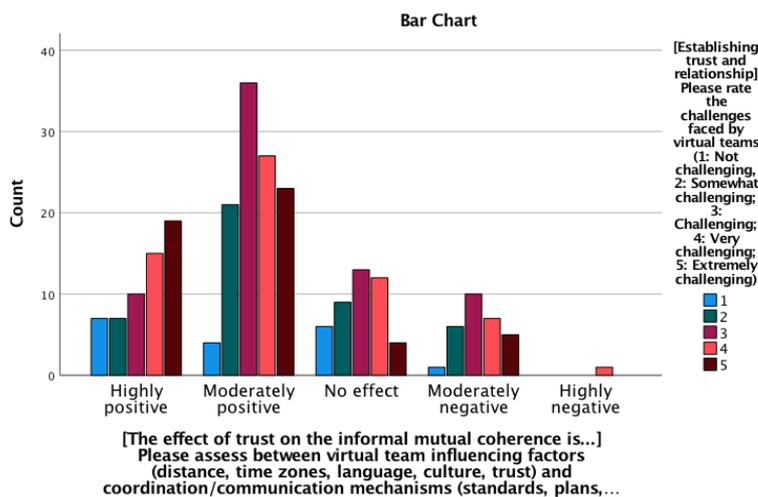
To compare the relation between trust and managing conflict, Chi-square test was conducted. Frequencies were not significantly different between trust and managing conflict, $X^2(16, N = 243) = 15.636, p = .479$, and managing conflict was found very challenging (45.7%).



Relation between trust and managing conflict

Establishing trust and relationship

To compare the relation between trust and establishing trust and relationship, Chi-square test was conducted. Frequencies were not significantly different between trust and establishing trust and relationship, $X^2(16, N = 243) = 21.886, p = .147$, and establishing trust and relationship were found challenging (52.2%).

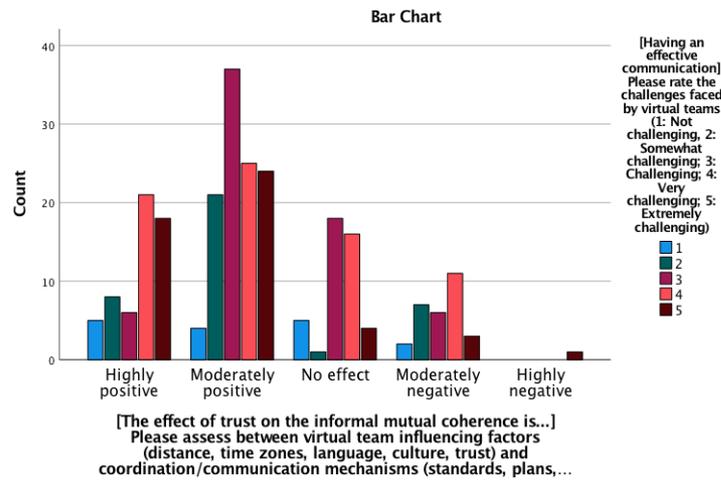


Relation between trust and establishing trust and relationship

Having an effective communication

Frequencies were significantly different between trust and having an effective communication, $X^2(16, N = 243) = 37.051, p = .002$, and having an effective communication was found challenging (55.2%).

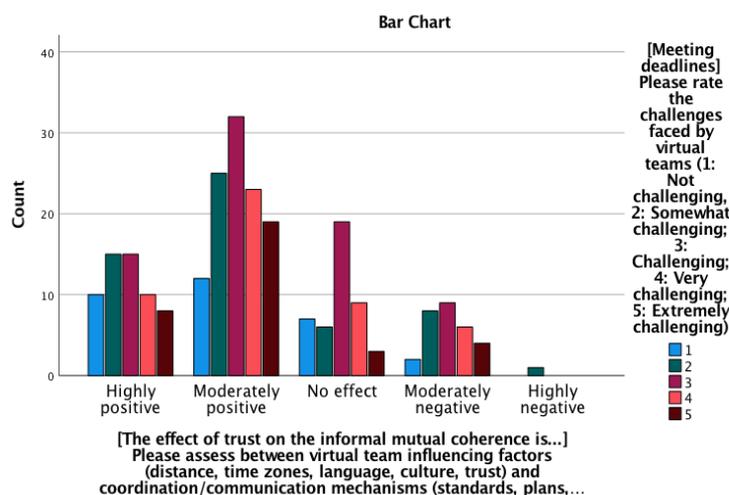
Appendix



Relation between trust and effective communication

Meeting deadlines

To compare the relation between trust and meeting deadlines, Chi-square test was conducted. Frequencies were not significantly different between trust and meeting deadlines, $X^2(16, N = 243) = 13.381, p = .645$, and meeting deadlines were found challenging (42.7%).

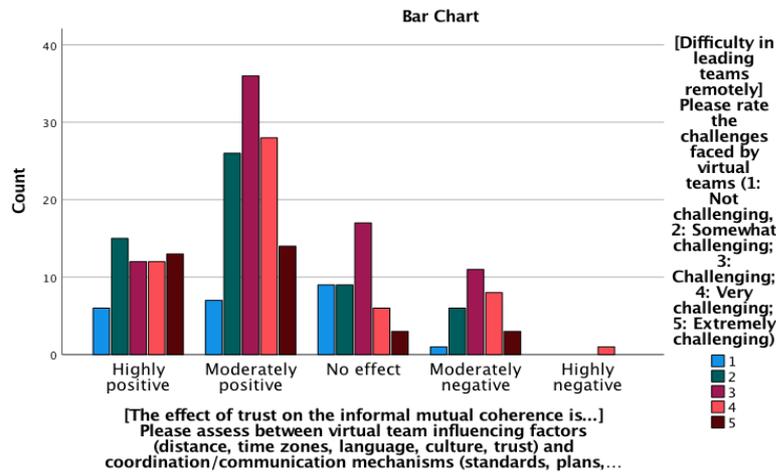


Relation between trust and meeting deadlines

Difficulty in leading teams remotely

To compare the relation between trust and difficulty in leading teams remotely, Chi-square test was conducted. Frequencies were not significantly different between trust and difficulty in leading teams remotely, $X^2(16, N = 243) = 22.491, p = .128$, and difficulty in leading teams remotely was found challenging (47.4%).

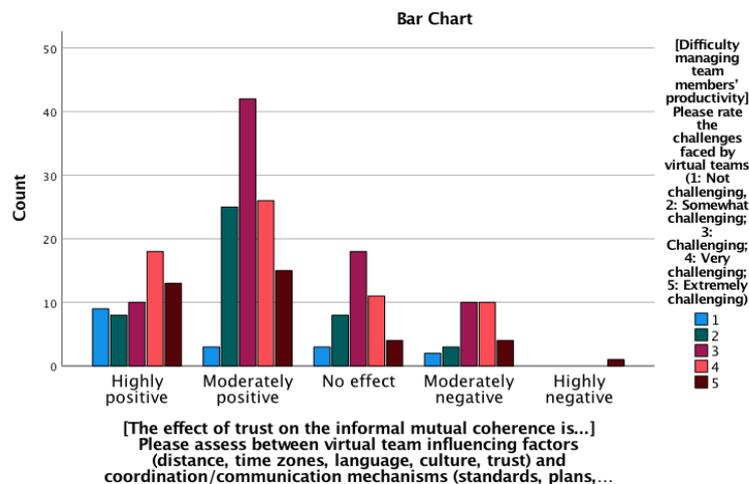
Appendix



Relation between trust and leading teams remotely

Difficulty managing team members' productivity

Frequencies were significantly different between trust and difficulty managing team members' productivity, $X^2(16, N = 243) = 28.156, p = .030$, and difficulty managing team members' productivity was found challenging (52.5%).



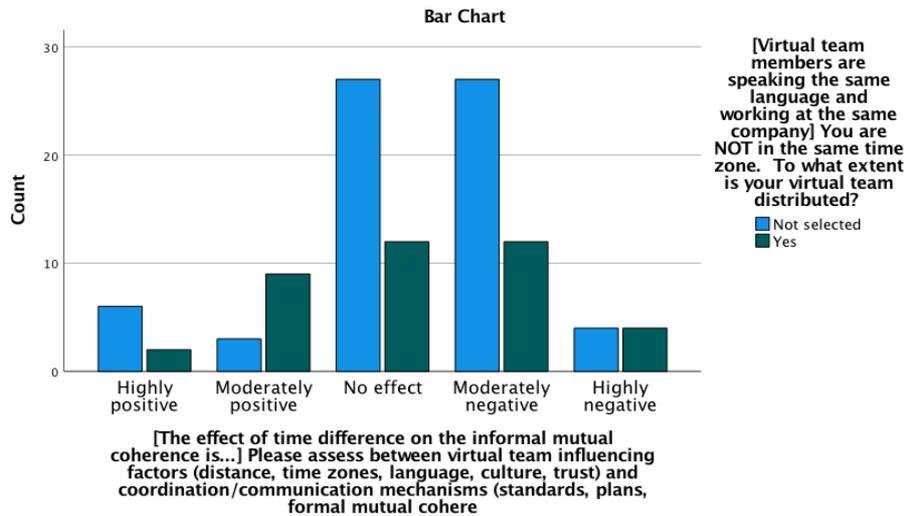
Relation between trust and managing team members' productivity

Appendix 78. H24 & You are NOT in the same time zone

Virtual team members are speaking the same language and working at the same company

To compare the same language, same company and time difference, Chi-square test was conducted. There was a significant difference between same language, same company and time difference, $X^2(4, N = 106) = 9.828, p = .043$, virtual team members who are speaking the same language and working at the same company rated that language difference has a moderately negative effect on the informal mutual coherence.

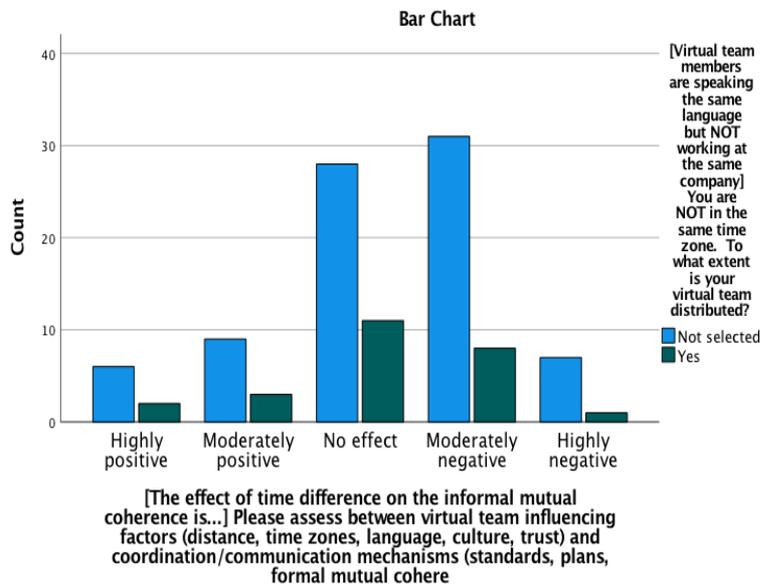
Appendix



Relationship between same language, same company and informal mutual coherence

Virtual team members are speaking the same language but NOT working at the same company

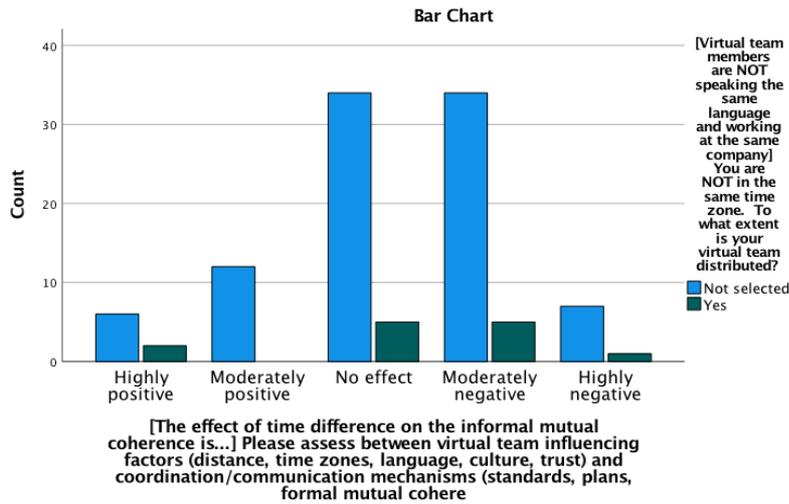
To compare the same language, different company and time difference, Chi-square test was conducted. There was not a significant difference between same language, different company and time difference, $X^2(4, N = 106) = 1.234, p = .873$, virtual team members who are speaking the same language and working at different company rated that language difference has no effect on the informal mutual coherence.



Relationship between same language, different company and informal mutual coherence

Virtual team members are NOT speaking the same language and working at the same company

To compare the different language, same company and time difference, Chi-square test was conducted. There was not a significant difference between different language, same company and time difference, $X^2(4, N = 106) = 2.906, p = .574$, virtual team members who are speaking the different language and working at the same company rated that language difference has a moderately negative effect on the informal mutual coherence.

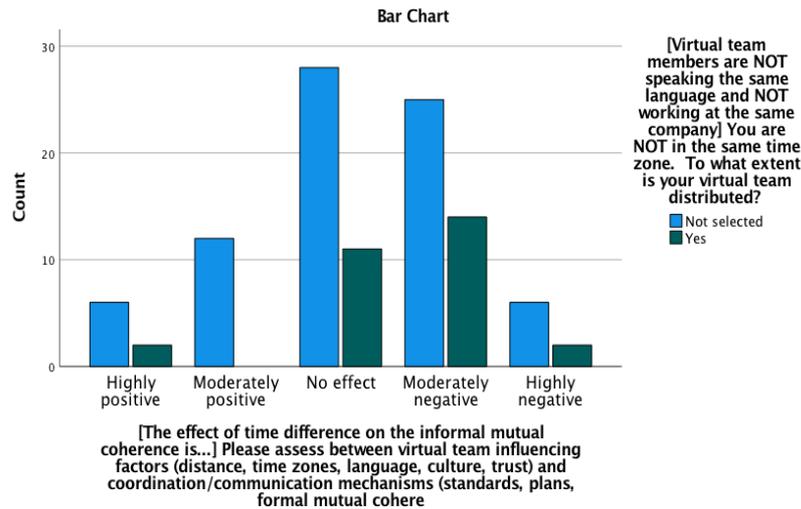


Relationship between different language, same company and informal mutual coherence

Virtual team members are NOT speaking the same language and NOT working at the same company

To compare the different language, different company and time difference, Chi-square test was conducted. There was not a significant difference between different language, different company and time difference, $X^2(4, N = 106) = 6.009, p = .198$, virtual team members who are speaking the different language and working at different company rated that language difference has a moderately negative effect on the informal mutual coherence.

Appendix

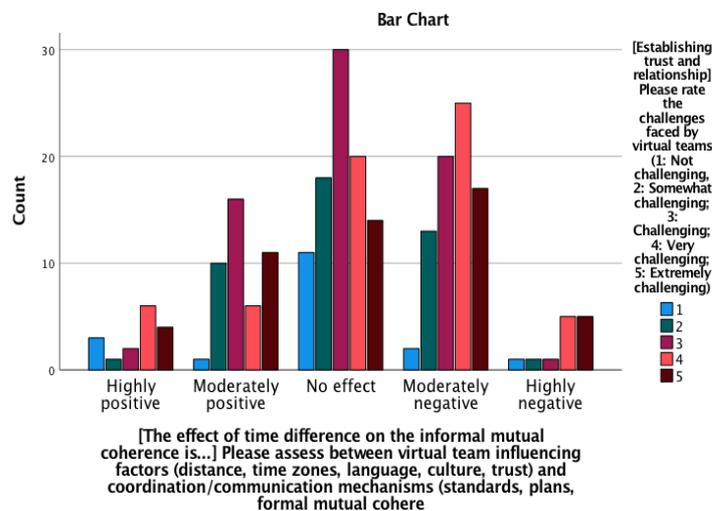


Relationship between different language, different company and informal mutual coherence

Appendix 79. Comparing the Challenges with Hypothesis 24

Establishing trust and relationship

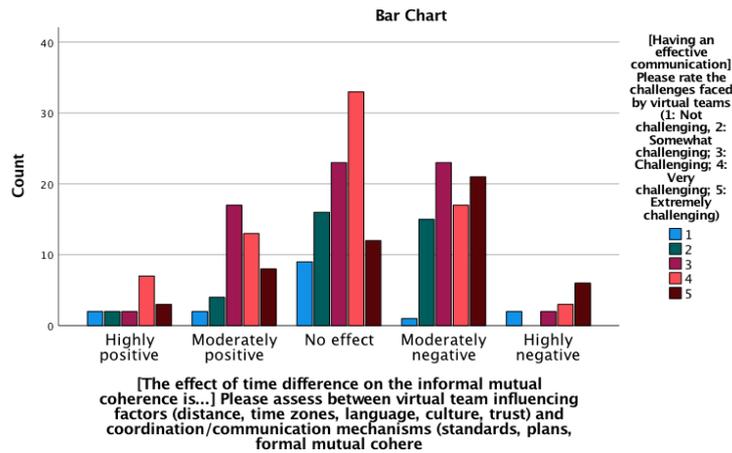
Frequencies were significantly different between time difference and establishing trust and relationship, $X^2(16, N = 243) = 27.133, p = .040$, and establishing trust and relationship were found challenging (43.5%).



Relation between time difference and establishing trust and relationship

Having an effective communication

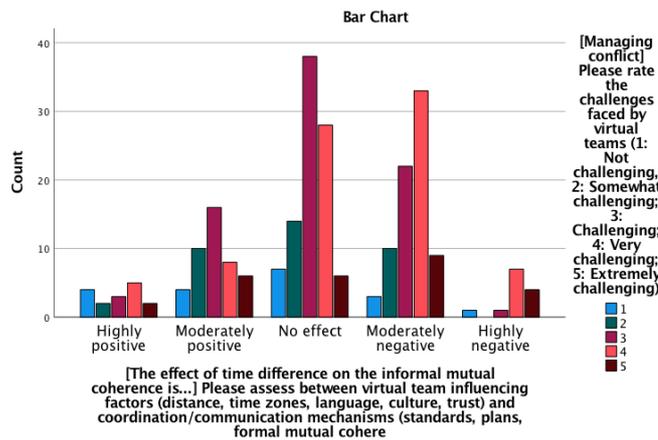
Frequencies were significantly different between time difference and having an effective communication, $X^2(16, N = 243) = 28.345, p = .029$, and having an effective communication was found very challenging (45.2%).



Relation between time difference and effective communication

Managing conflict

Frequencies were significantly different between time difference and managing conflict, $X^2(16, N = 243) = 31.268, p = .012$, and managing conflict was found challenging (47.5%).

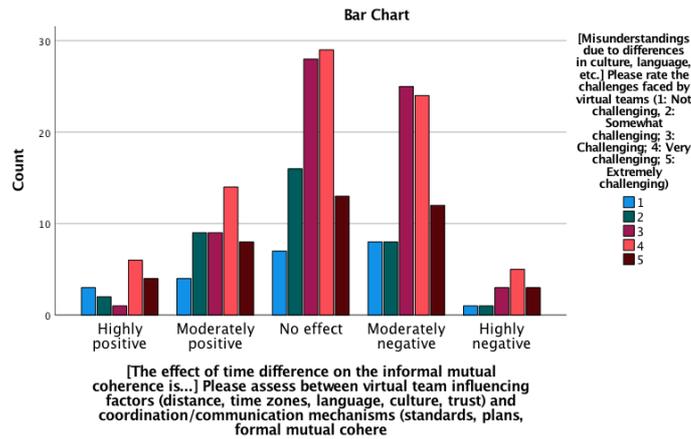


Relation between time difference and managing conflict

Misunderstandings due to differences in culture, language

To compare the relation between time difference and misunderstandings due to differences, Chi-square test was conducted. Frequencies were not significantly different between time difference and misunderstandings due to differences, $X^2(16, N = 243) = 11.123, p = .802$, and misunderstandings due to differences were found very challenging (37.2%).

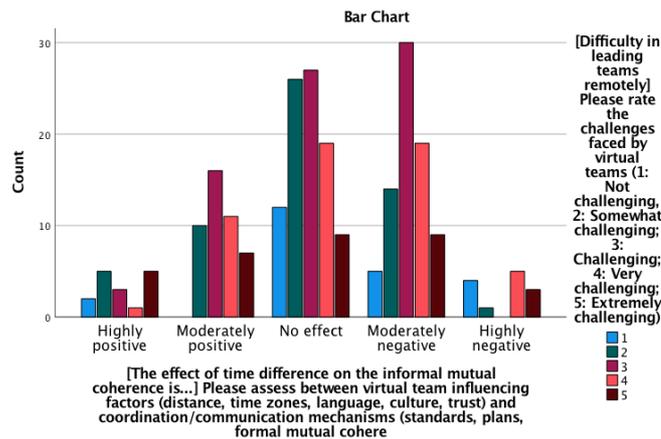
Appendix



Relation between time difference and misunderstandings

Difficulty in leading teams remotely

Frequencies were significantly different between time difference and difficulty in leading teams remotely, $X^2(16, N = 243) = 32.584, p = .008$, and difficulty in leading teams remotely was found challenging (39.5%).

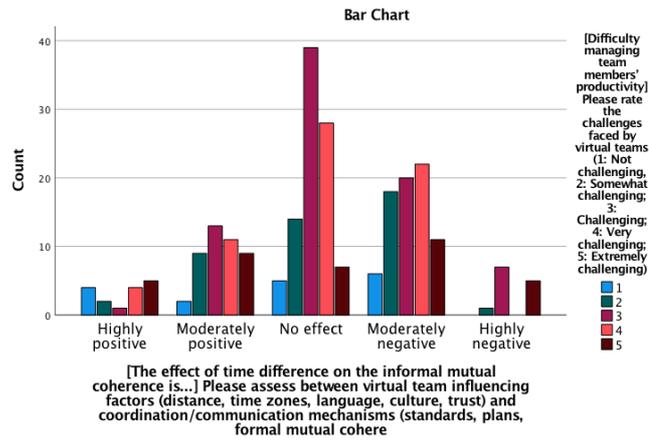


Relation between time difference and leading teams remotely

Difficulty managing team members' productivity

Frequencies were significantly different between time difference and difficulty managing team members' productivity, $X^2(16, N = 243) = 36.528, p = .002$, and difficulty managing team members' productivity was found challenging (48.8%).

Appendix



Relation between time difference and managing team members' productivity

Appendix 80. Survey Questions



You are invited to participate in “Virtual Team Efficiency Survey”, that is being conducted by Technical University Berlin, Chair of Human-Machine Systems.

Section A: Demographic Questions

A1. Please indicate your gender.

Male

Female

A2. Please indicate your age.

34 and under

35 - 50

over 50

A3. Please indicate the industry sector that your work.

Information technology

Manufacturing, aerospace, transportation

Finance, insurance, legal, accounting

Consumer products

Education

Pharmaceuticals, medical devices, healthcare

Construction, engineering

Chemicals, agriculture

Other

Other

A4. Please indicate the size of your organization (i.e. number of employees).

Less than 50

50 - 100

100 - 500



500 - 1000

1000 - 5000

5000 - 10000

above 10000

Other

Other

A5. In which country are you personally located?

Germany

United Kingdom

Switzerland

Spain

Sweden

Belgium

France

Italy

Netherlands

Finland

Turkey

Denmark

Austria

Czech Republic

Other

Other



A6. Are you working in a virtual team? (A team which has members working from different places - office/city/country/work from home)

Yes

No

A7. Given the definition of a traditional team provided in the introduction of this questionnaire, please indicate the numbers of years experience you worked in a traditional team.

Less than 1 yr

1 yr - 2 yrs

3 yrs - 5 yrs

6 yrs - 10 yrs

more than 10 yrs

Other

Other

A8. Given the definition of a virtual team provided in the introduction of this questionnaire, please indicate the numbers of years experience you worked in a virtual team.

Less than 1 yr

1 yr - 2 yrs

3 yrs - 5 yrs

6 yrs - 10 yrs

more than 10 yrs

Other

Other



Section B: Traditional Team Purpose, Goals and Roles

B1. Please assess the purpose, goals and roles according to your traditional team (1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree)

	1	2	3	4	5
Team members have a shared purpose.	<input type="checkbox"/>				
Team members have unique skills to do their jobs effectively.	<input type="checkbox"/>				
Team members set and meet the the goals of the project.	<input type="checkbox"/>				
Team members produce efficient results.	<input type="checkbox"/>				
The mission and goals of the team are well aligned with the organization's mission.	<input type="checkbox"/>				
Team members understand one another's roles.	<input type="checkbox"/>				
Overlapping tasks are not problem for team members.	<input type="checkbox"/>				

Section C: Communication with Other Team Members in Traditional Teams

C1. Please assess communication with other team members in your traditional team (1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree)

	1	2	3	4	5
Team members are effective listeners.	<input type="checkbox"/>				
Communication is transparent between team members.	<input type="checkbox"/>				
Team members trust each other.	<input type="checkbox"/>				
Team members show high levels of cooperation and mutual support to each other.	<input type="checkbox"/>				
Team members established supportive relationship with other teams.	<input type="checkbox"/>				



Section D: Decision Making and Problem Solving in Traditional Teams

D1. Please assess decision making and problem solving according to your traditional team (1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree)

	1	2	3	4	5
Team members take initiative to solve the problems without the team leader.	<input type="checkbox"/>				
Team leader and team members give each other a constructive feedback.	<input type="checkbox"/>				
Team members can resolve differences in ways of doing business.	<input type="checkbox"/>				
Team members work with a great deal of flexibility so changing can be adapted easily.	<input type="checkbox"/>				
Team members arrange their priorities to meet the needs of the project.	<input type="checkbox"/>				
Team members focus on big picture strategic issues of the project.	<input type="checkbox"/>				

Section E: Traditional Team Performance

E1. Please assess the performance of your traditional team (1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree)

	1	2	3	4	5
Team members are continually working to improve the success factors and key performance indicators.	<input type="checkbox"/>				
Group meetings are very efficient and productive.	<input type="checkbox"/>				
Team members are rewarded in the team.	<input type="checkbox"/>				
Team members use different tools/techniques to keep their skills up-to-date.	<input type="checkbox"/>				
Development opportunities are provided to team members.	<input type="checkbox"/>				

E2. Please add any other issues related to traditional teamwork challenges which are not included in this survey.



75 % - 100 %

Other

Other

F5. Do all members on the same time zone?

Yes

No

F6. You are in the same time zone.

Do all members work at the same country?

Yes

No

F7. You are in the same time zone and working at the same country.

To what extent is your virtual team distributed?

Virtual team members are speaking the same language and working at the same company

Virtual team members are speaking the same language but NOT working at the same company

Virtual team members are NOT speaking the same language and working at the same company

Virtual team members are NOT speaking the same language and NOT working at the same company

F8. You are in the same time zone but NOT in the same country.

To what extent is your virtual team distributed?

Virtual team members are speaking the same language and working at the same company

Virtual team members are speaking the same language but NOT working at the same company

Virtual team members are NOT speaking the same language and working at the same company

Virtual team members are NOT speaking the same language and NOT working at the same company

F9. You are NOT in the same time zone.

To what extent is your virtual team distributed?

Virtual team members are speaking the same language and working at the same company

Virtual team members are speaking the same language but NOT working at the same company



Virtual team members are NOT speaking the same language and working at the same company

Virtual team members are NOT speaking the same language and NOT working at the same company

F10. To what extent is the virtual team culturally diverse?

There is no cultural diversity within the team.

There is a small mix of cultural diversity within the team.

There is a remarkable degree of cultural diversity within the team.

The team is 100 % culturally diverse.

Other

Other

F11. Do you know any of the virtual team member from previous projects?

Have no prior project work with any of the team members.

Have worked with small number of team members on a previous projects.

Have worked with some members on a previous projects.

Have worked with all members on previous projects.

F12. What is your role within the virtual team project?

Project Leader/Coordinator

Comment

Project Manager

Comment

Team member

Comment

Researcher

Comment



Other, please specify

Comment

F13. How often does your team meet in person?

Never

Once a year

Twice a year

Three times or more a year

Other

Other



Section G: Assessing Critical Success Factors in Virtual Teams I

G1. Please assess the critical success factors according to your virtual team

	High positive effect	Moderately positive effect	No effect	Moderately negative effect	High negative effect
In virtual teams, cultural difference has a positive/negative impact on team effectiveness.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In virtual teams, language difference has a positive/negative impact on team effectiveness.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In virtual teams, distance has a positive/negative impact on team effectiveness.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In virtual teams, time difference has a positive/negative impact on team effectiveness.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meeting face-to-face has a positive/negative impact on communication and team effectiveness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In virtual team environments, leadership has an impact on team effectiveness.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In virtual teams, knowledge sharing among team members has a positive/negative impact on team effectiveness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In virtual team environments, knowledge sharing has a positive/negative impact on trust among team members	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In virtual teams, effective leadership has a positive/negative impact on trust among team members	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Good access to technical training has a positive/negative impact on team effectiveness.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The culture supports shared ways of doing business across teams and organisations thus, has a positive/negative impact on team effectiveness.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
High trust between organisations and team members has a positive/negative impact on team effectiveness.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Team members' experience in working across boundaries has a positive/negative impact on team effectiveness.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The skills of the project manager/leader has a positive/negative impact on the performance of the virtual team.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Section H: Assessing Critical Success Factors in Virtual Teams II

H1. Please assess between virtual team influencing factors (distance, time zones, language, culture, trust) and coordination/communication mechanisms (standards, plans, formal mutual coherence, informal mutual coherence)

(Coordination by standards refers to methodologies, codes of practice. Coordination by plans refers to project plans, schedules. Coordination by formal mutual coherence refers to project meetings in a pre-defined manner. Coordination by informal mutual coherence refers interacting in an informal manner such as e-mails, informal meetings).

	Highly positive	Moderately positive	No effect	Moderately negative	Highly negative
The effect of distance on the effectiveness of standards is...	<input type="checkbox"/>				
The effect of language difference on the effectiveness of standards is...	<input type="checkbox"/>				
The effect of trust on the effectiveness of standards is...	<input type="checkbox"/>				
The effect of distance on the effectiveness of plans is...	<input type="checkbox"/>				
The effect of cultural difference on the effectiveness of plans is...	<input type="checkbox"/>				
The effect of trust on the effectiveness of plans is...	<input type="checkbox"/>				
The effect of time difference on effectiveness of plans is...	<input type="checkbox"/>				
The effect of distance on the formal mutual coherence is...	<input type="checkbox"/>				
The effect of language difference on the formal mutual coherence is...	<input type="checkbox"/>				
The effect of cultural difference on the formal mutual coherence is...	<input type="checkbox"/>				
The effect of trust on the formal mutual coherence is...	<input type="checkbox"/>				
The effect of time difference on the formal mutual coherence is...	<input type="checkbox"/>				
The effect of distance on the informal mutual coherence is...	<input type="checkbox"/>				
The effect of language difference on the informal mutual coherence is...	<input type="checkbox"/>				
The effect of cultural difference on the informal mutual coherence is...	<input type="checkbox"/>				
The effect of trust on the informal mutual coherence is...	<input type="checkbox"/>				
The effect of time difference on the informal mutual coherence is...	<input type="checkbox"/>				



Section I: Communication with Other Team Members in Virtual Teams

I1. Please assess communication with other team members in virtual environments (1: Not at all important; 2: Slightly Important; 3: Important; 4: Fairly Important; 5: Very Important)

	1	2	3	4	5
Check your email every day and respond within 24/48 hours.	<input type="checkbox"/>				
Check your voice mail every day and return within 24 hours.	<input type="checkbox"/>				
Exchange documents using Google Drive.	<input type="checkbox"/>				
Attend all mandatory meetings.	<input type="checkbox"/>				
If you cannot join the meeting let other people know.	<input type="checkbox"/>				
There are appropriate standards for electronic communication and tools across organizations.	<input type="checkbox"/>				
People from all functional and geographical areas have equal access and are skilled in using electronic communication and technology.	<input type="checkbox"/>				

Section J: Meeting Management in Virtual Teams

J1. Please assess meeting management in terms of virtual environments (1: Not at all important; 2: Slightly Important; 3: Important; 4: Fairly Important; 5: Very Important)

	1	2	3	4	5
Be on time for video conferences, audio conferences and other meetings.	<input type="checkbox"/>				
Rotate time zones for meetings.	<input type="checkbox"/>				
In video conferences or audio conferences, keep muted when not speaking.	<input type="checkbox"/>				
Do not interrupt others during the meetings.	<input type="checkbox"/>				
An agenda is sent out via email 24 hours in advance of every meeting and minutes are sent out via email 24 hours after the meeting.	<input type="checkbox"/>				
Respect the agenda.	<input type="checkbox"/>				



Section K: Decision Making and Problem Solving in Virtual Teams

K1. Please assess decision making and problem solving in terms of virtual environments (1: Not at all important; 2: Slightly Important; 3: Important; 4: Fairly Important; 5: Very Important)

	1	2	3	4	5
Keep the interests and goals of the team at the top of all decisions.	<input type="checkbox"/>				
Balance the local interests of team members with the entire team.	<input type="checkbox"/>				
If you need support, first contact the team member who is responsible from the project.	<input type="checkbox"/>				
Resolve differences in ways of doing business.	<input type="checkbox"/>				
Use an established conflict management process.	<input type="checkbox"/>				
Do not solve the problems by using email. Use the telephone and speak directly with the person, not with the team leader.	<input type="checkbox"/>				
Recognize that conflict is more difficult to solve in a virtual environment therefore do not let tensions build.	<input type="checkbox"/>				

Section L: Virtual Team Performance

L1. Please answer the following questions in terms of performance of the virtual teams (1: Unsatisfactory; 2: Improvement needed; 3: Meet expectations; 4: Exceeds expectations; 5: Exceptional)

	1	2	3	4	5
The output of the project/work which the team produces is...	<input type="checkbox"/>				
The quality of the work is...	<input type="checkbox"/>				
The effectiveness of the team's interactions is...	<input type="checkbox"/>				
The team's ability to meet the deadlines is...	<input type="checkbox"/>				
The team's ability to meet the project budget is...	<input type="checkbox"/>				
The team's ability to meet the goals of the project is...	<input type="checkbox"/>				

L2. Which is the most beneficial form of communication between team members?

Face-to-face meetings

Audio conference

Video conference



Group emails

Social media tools

Mobile phone or other mobile device

Voice over IP tools (e.g. Skype)

Online office suite (e.g. Google Docs)

Other

Other

Section M: Working Together to Review Documents in Virtual Teams

M1. Please assess working together to review documents in virtual environments (1: Not at all important; 2: Slightly Important; 3: Important; 4: Fairly Important; 5: Very Important)

	1	2	3	4	5
Review/assess long document details except audio or video conference sessions.	<input type="checkbox"/>				
Keep confidential documents within the team.	<input type="checkbox"/>				
While working sequentially, give feedback on time.	<input type="checkbox"/>				
Review the team's and project progress weekly or bi-weekly via audio/video conference.	<input type="checkbox"/>				
There are mechanisms for sharing knowledge across boundaries.	<input type="checkbox"/>				
Working in a virtual environment requires a specific skills.	<input type="checkbox"/>				
Creating a sense of ownership of the project/goals is important for virtual teams.	<input type="checkbox"/>				
Leaders have skills such as working across boundaries and using technology effectively.	<input type="checkbox"/>				



Section N: Challenges in Virtual Teams

N1. Please rate the challenges faced by virtual teams (1: Not challenging, 2: Somewhat challenging; 3: Challenging; 4: Very challenging; 5: Extremely challenging)

	1	2	3	4	5
Managing conflict	<input type="checkbox"/>				
Establishing trust and relationship	<input type="checkbox"/>				
Having an effective communication	<input type="checkbox"/>				
Time zones	<input type="checkbox"/>				
Partners/members who do not participate meetings	<input type="checkbox"/>				
Misunderstandings due to differences in culture, language, etc.	<input type="checkbox"/>				
Meeting deadlines	<input type="checkbox"/>				
Loss of productivity due to the IT problems	<input type="checkbox"/>				
Presenting ideas during meetings	<input type="checkbox"/>				
Adhering to agenda	<input type="checkbox"/>				
Difficulty in leading teams remotely	<input type="checkbox"/>				
Technical and/or cost issues	<input type="checkbox"/>				
Difficulty managing team members' productivity	<input type="checkbox"/>				
Other	<input type="checkbox"/>				

N2. Please add any other issues related to virtual teams and virtual teamwork challenges which are not included in this survey.



Confidentiality

It is anticipated that the results of this survey will be shared with others in the following ways: disseminated via academic publications, presented at academic conferences, and during the thesis defense.

Thank you for participating in this questionnaire.