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Impacts of distance in offshore software development projects

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ABSTRACT:

The progressively rapid globalization in the field of information systems has resulted in the rising popularity of software companies carrying out their development in so-called offshore locations. This phenomenon in combination with the impacts of the present global health crisis, might lead to globally distributed teams becoming the new normal in the modern business landscape. The trend of organizations promoting cooperation uninhibited by distance between colleagues keeps gaining interest, which makes it a promising line of research with several unanswered questions to be addressed.

In the field of information systems, offshore development is an increasingly attractive method of gaining financial advantage and a larger labour pool by transferring development to lower cost countries. The teams in collaboration with one another in offshore ventures are often divided by significant distance in temporal, geographical, and socio-cultural distance, indicating potentially major differences in e.g., time zones, languages, values, and business cultures. The three pillars of a successful agile offshore relationship, communication, coordination, and control are impacted in different ways by these distances.

This thesis research aims to identify challenges related to distance in in-house offshore development utilized in agile software development projects. To reach the goal of this thesis research, the following research question must be answered: How do the dimensions of distance impact agile in-house offshore software development projects? This research question is answered through a qualitative research method of interpretive case study. The data for this research is gathered through semi-structured interviews, and it is analysed based on a theoretical background built through a literature review of existing research on the subject of offshore development.

The data collected and analysed through this research provides clear evidence, that the three dimensions of distance, namely temporal, geographical, and socio-cultural distances have a distinct impact in agile in-house offshore development projects. All of the three pillars of a successful offshore relationship, communication, coordination and control were found to be evidently affected by these aforementioned distances. Temporal distance was found to have a lower effect than expected, causing impact mostly through the lessened number of overlapping hours between teams, and the use of asynchronous collaboration methods. Geographical distance was found to cause a lack of teamness, and to increase costs and logistics of holding face-to-face meetings. The largest impact out of the three distances was found to be socio-cultural distance, having a great impact through language barriers, and cultural differences in work practices, authority, and hierarchy. Pre-existing research findings were confirmed, and in addition some new findings related to the impacts of distance were made as well.

KEYWORDS: Offshore development, agile, distributed software development

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TIIVISTELMÄ:
Tietojärjestelmäkehittämisen alan kiihtyvä globalisaatio on johtanut niin sanotuissa offshore-kohteissa suoritettavan ohjelmistokehityksen suosion kasvuun. Offshore-kehittämisen yleistyminen, sekä nykyisen globaalin terveyskriisin vaikutukset saattavat johtaa maantieteellisesti jakautuneiden tiimien yleistymiseen modernissa liiketoimintaympäristössä. Organisaatiot edistävät jatkuvasti enemmän maantieteellisesti jakautuneiden tiimien välistä yhteistyötä, tehden offshore-kehittämisestä lupaavan tutkimusalan, jossa on useita tutkimuskysymyksiä vailla vastauksia.

Tietojärjestelmäkehityksen alalla offshore-kehitys on yhä houkuttelevampi tapa luoda taloudellista etua ja suurempi työvoimareservi siirtämällä itse kehittäminen halvemman kustannustason maihin. Offshore-kehittämistä hyödyntävissä hankkeissa toistensa kanssa yhteistyössä työskentelevät tiimit kokevat usein huomattavia ajallisia, maantieteellisiä ja sosiokulttuurisia etäisyyksiä. Nämä etäisyydet luovat yksilöiden välille suuria eroja esimerkiksi aikavyöhykkeissä, kielissä, arvoissa ja liiketoimintakulttuureissa. Nämä etäisyydet vaikuttavat eri tavoin onnistuneen ketterän offshore-suhteen kolmeen peruspilariin: kommunikaatioon, koordinaatioon ja kontrolliin.

Tämän opinnäytetyön tavoitteena on tunnistaa etäisyyteen liittyviä haasteita ketterissä ohjelmistokehitysprojekteissa, joissa hyödynnetään in-house offshore-kehittämistä. Tämän tavoitteen saavuttamiseksi on vastattava seuraavaan tutkimuskysymykseen: miten etäisyyden ulottuvuudet vaikuttavat ketteriin in-house offshore-ohjelmistokehitysprojekteihin? Tämän tutkimuksen tutkimusmenetelmänä käytetään tulkitsevaa case-tutkimusta, joka on kvalitatiivinen tutkimusmenetelmä. Tutkimusta varten data-aineisto on kerätty puolistrukturoiduilla haastatteluilla. Haastatteluista kerätyn datan analyysiä varten on kirjallisuuskatsauksen kautta luotu teoreettinen tausta, joka perustuu aikaisempaan tutkimukseen liittyen offshore-kehittämiseen.

Tutkimuksen kautta kerätty ja analysoitu data antaa selkeää näyttöä sille, että etäisyyden kolmella ulottuvuudella, eli ajallisella, maantieteellisellä ja sosiokulttuurisilla etäisyyksillä, on selvä vaikutus ketterissä in-house offshore-kehitysprojekteissa. Näiden edellä mainittujen etäisyyksien havaittiin vaikuttavan selvästi kaikkiin onnistuneen offshore-suhteen kolmeen pilariin: kommunikaatioon, koordinaatioon ja kontrolliin. Ajallisen etäisyyden havaittiin vaikuttavan odotettua vähemmän, sillä sen suurimmat vaikutukset liittyivät lähinnä tiimien välisten päällekkäisten työtuntien vähenemisen ja asynkronisten kommunikaatiomenetelmien käytön kautta. Maantieteellisen etäisyyden todettiin aiheuttavan 'teamnessin' puutetta, sekä kasvokkain järjestettävien tapaamisten kustannusten kasvua. Sosiokulttuurinen etäisyys todettiin olevan kolmesta etäisyydestä merkittävin. Sen merkittävimpiä vaikutuksia todettiin olevan muun muassa kielimuuri, sekä kulttuurierot työkäytännöissä, auktoriteetissa ja hierarkiassa. Tämän tutkimuksen myötä vahvistettiin aikaisempia tutkimuslöydöksiä, sekä luotiin täysin uusia havaintoja.

AVAINSANAT: Offshore-kehittäminen, hajautettu ohjelmistokehittäminen, ketterä ohjelmistokehittäminen

Contents

Figures

Tables

1 Introduction

The progressively rapid globalization in the field of information systems has resulted in the rising popularity of software companies carrying out their development in so-called offshore locations (Holmstrom et al., 2006). As found by VersionOne (2020) in the most recent annual State of Agile report, up to 71% of responding agile organizations report utilizing collaborative teams across the globe, free of geographic borders. The report states, that in combination with the impacts of the present global health crisis, globally distributed teams may become the "new normal" (p. 9) in the modern business land-scape. Based on prior research and the findings by VersionOne (2020), the trend of or-ganizations promoting cooperation uninhibited by distance between colleagues keeps gaining interest, which is why it is a promising line of research with several questions to be addressed. Therefore, this paper discusses the trend of offshore development, with a focus on identifying the challenges and impacts caused by the dimensions of distance between collaborative teams.

Bass (2016) defines offshore development as involving a remote offshore team in a de-velopment project, often divided from their on-site counterparts by substantial geo-graphical distance. Bass adds that the distance between teams is usually accompanied by considerable differences in time zones and culture. Holmstrom et al. (2006) state, that by conducting their software development via offshoring, businesses seek potential ben-efits, such as cost advantages, round the clock development, and a wider skill base and labor pool. The authors add that these benefits do not come without potentially signifi-cant drawbacks as in addition to geographical distribution, differences in time zone and culture can create considerable challenges within the project. Höfner and Mani (2007) identify communication, coordination, and control as the most essential qualities of a successful offshore relationship that are inhibited as distance between teams increases.

The goal of this thesis' research is to investigate how does the distance between teams affect in-house offshore software development projects. As previously mentioned, the

globalization of the software development market is pushing modern projects into a more geographically diverse environment, making offshoring a vital tool and thus, an important subject of research. As the concept of offshoring keeps gaining interest, so does the significance of research into the benefits and challenges often accompanied with it, making this thesis research topical and of high significance. To reach the goal of this thesis research, the following research question must be answered:

How do the dimensions of distance impact agile in-house offshore software development projects?

To specify, the study aims to investigate, and add new knowledge about how temporal distance, geographical distance, and socio-cultural distance effect communication, coordination, and control in agile software development projects does, where in-house offshoring is utilized.

To answer the research question, a theoretical background is first built through a literature review in the second chapter of this thesis. The chapter focuses on the topics of agile software development, including the concept of agility and the most common agile methodologies. The concept of offshore development is discussed, along with categorising the challenges often accompanied with it. The dimensions of distance, namely temporal, geographical, and socio-cultural are presented, along with the three pillars of a successful offshore relationship impacted by these distances: communication, coordination, and control. Through the literature review a theoretical context is identified, which is used as the framework of the empirical section of this research.

In the third chapter, the case context and research methodology of this study is presented. In this chapter, the case context is presented as being a multinational company specializing in information technology services, which uses in-house offshoring in projects. Following the case context, the qualitative research method chosen for this study, i.e., interpretive case study is discussed. In addition, the data collection method of semi

structured interviews, and data analysis method of coding to categories based on previous research are described in detail. In the fourth chapter the research findings are described in depth, by categorizing the findings into each dimension of distance, and to subcategories of how each distance impacts the three pillars of an offshore relationship.

Finally, in the fifth chapter the results of the research are discussed in comparison to previous research on the subject. Again, each dimension of distance is discussed in detail, with a goal of identifying discoveries which confirm existing research, contradict existing research and findings which are entirely new. In addition, this chapter presents the limitations of the research, and future research topics.

2 Background

In this chapter, a theoretical background for this research is built through a literature review. The chapter focuses on the topics of agile software development, including the concept of agility, along with the values and principles of it, and the most common agile methodologies. The concept of offshore development is discussed next, along with categorising the challenges often accompanied with it. The dimensions of distance, namely temporal, geographical, and socio-cultural are presented, along with the three pillars of a successful offshore relationship impacted by these distances: communication, coordination, and control. Through the literature review a theoretical context is identified, which is used as the framework of the empirical section of this research.

2.1 Agile software development

Approaching the turn of the millennium, the software industry was in distress, as traditional software development projects were extremely unpredictable and more often than not failing to deliver within budget and schedule (Flewelling, 2018, p. 6). With the combination of the rising necessity of information systems as the backbone of most businesses, and the accelerating rate of change in the business environment, software projects were likely to fail, as they were not able to adapt to rapid shifts in scope and requirements (Holcombe, 2008, p. 1). These failures, usually in projects over a certain scope, were negatively affecting the reputation of the entire software industry, leading to experts in the software development community to question the accustomed practices in their field (Holcombe, 2008, p. 2). According to Kelly (2008, p. 17), a number of professionals in the community recognized these issues and published a variety of "lightweight" methodologies with the same types of concepts and philosophies. Kelly adds that these proposed methodologies were high in resemblance and ultimately the authors joined in the creation of the Agile manifesto, and consequently, the creation of agile software development. The creators of the Agile manifesto, or the so-called Agile

Alliance defined four main values, and twelve principles for agile software development, which will be discussed in the following chapters.

2.1.1 Values of agile software development

As can be seen in figure 1, the first value of the agile manifesto is emphasizing "individuals and interactions over processes and tools" (Beck et al., 2001a). This by no means implies the complete absence of tools and processes, but keeping their utilization minimal, and highlighting collaboration and communication amongst individuals, with a goal of keeping non-specialized associates just as up-to-date as the technical experts (Flewelling, 2018, p. 18). Kelly (2008, p. 18) expands that the Alliance noticed that although writing and education about software development is concentrated on processes and tools, the people within the project are the ones making the difference, which is why individuals and their importance is highlighted in the manifesto.

Manifesto for Agile Software Development

We are uncovering better ways of developing software by doing it and helping others do it.
Through this work we have come to value:

Individuals and interactions over processes and tools

Working software over comprehensive documentation

Customer collaboration over contract negotiation

Responding to change over following a plan

That is, while there is value in the items on the right, we value the items on the left more.
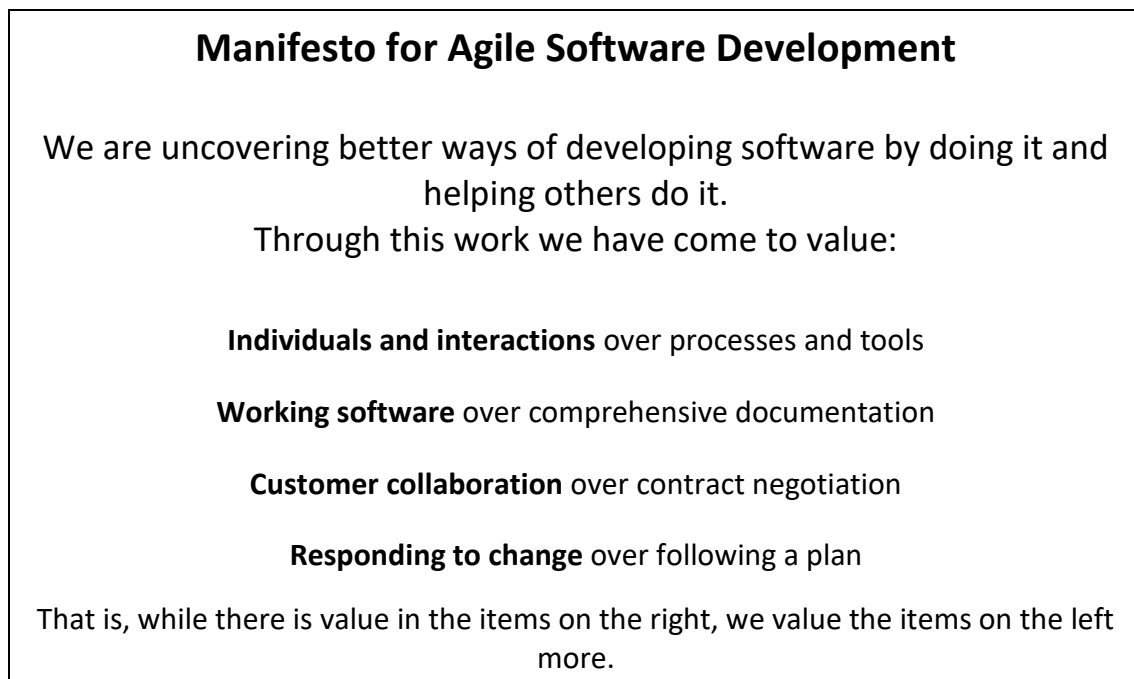

Figure 1. The Agile Manifesto (Adapted from Beck et al., 2001a).

Beck et al. (2001a) describe that the second value focuses on delivering functional software and fulfilling the client's need, by emphasizing "working software over comprehensive documentation". The client is usually not as savvy with technical documentation, so the client's personal interpretation of the documentation might lead to misunderstandings, and consequently unwanted functionality in the delivered product (Flewelling, 2018, p. 19). The most efficient way of confirming that the functionality being built will work exactly as they wish, is bringing them prototypes of working usable software as early as possible, and collecting feedback, so changes can be made if necessary (Kelly, 2008, p. 20).

Thirdly, in pursuit of avoiding constraints in the software development process, "customer collaboration over contract negotiation" is accentuated in the manifesto (Beck et al., 2001a). According to Flewelling (2018, p. 19.), as delivering value to the client is the main goal of the venture, constraints that may slow down delivery, such as contracts and additional bureaucracy, should be kept out of the way of delivering value to the client. Flewelling adds that it is highly likely that some features will not function as desired, or some findings are made along the way affecting the entire project. He emphasizes that it is important to find a common ground between client and supplier, in order to continue satisfying the client's needs.

As the fourth and final main value of the Agile manifesto is "responding to change over following a plan" (Beck et al., 2001a). Flewelling (2018, p. 19) compares the aforementioned value to planning operations in the military, as the planned actions are based on finite information in an unpredictable environment. Just as in an agile software project, instead of sticking to a predetermined plan, the planning is constantly in motion, and adjusted as new information is discovered. This approach tackles the challenges witnessed in traditional software development, where the originally planned functionality may become outdated during development, making the delivered product obsolete in cases where the business environment is under rapid transformation. Flewelling adds

that this ability to react to a fluid business environment and adjust plans accordingly is what makes agile software development agile and supports the creation of value.

2.1.2 Principles of agile software development

The aforementioned four values of agile software development focused on individuals, collaboration, outcomes, and responsiveness. The following twelve principles which can be seen in figure 2, were created by the Agile Alliance to support and shed light on how these values can be endorsed.

Principles behind the Agile Manifesto

We follow these principles:

Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.

Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.

Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.

Business people and developers must work together daily throughout the project.

Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.

The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.

Working software is the primary measure of progress.

Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.

Continuous attention to technical excellence and good design enhances agility.

Simplicity--the art of maximizing the amount of work not done--is essential.

The best architectures, requirements, and designs emerge from self-organizing teams.

At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.
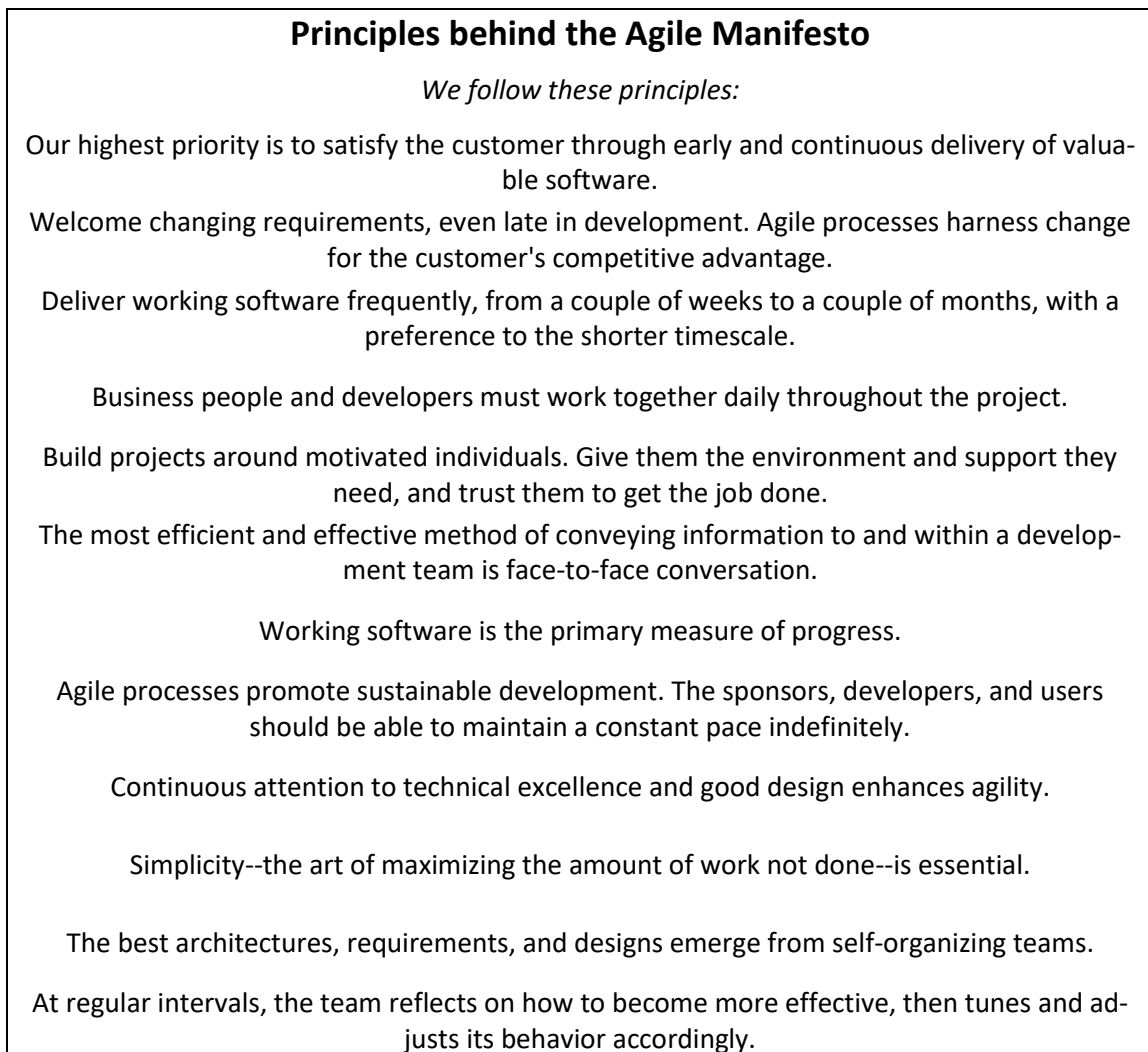

Figure 2. Principles behind the Agile Manifesto (Adapted from Beck et al., 2001b).

In order to support efficient agile delivery, it is highly important to enable dynamic delivery within a dynamic team and support the motivation of individuals and the interactions amongst them (Flewelling, 2018). These ideas are the main philosophies behind the agile value "individuals and interactions over processes and tools", and it is facilitated by the following agile principles (Beck et al., 2001b). The fifth and eleventh principles of the Agile Manifesto are to "build projects around motivated individuals", and "the best architectures, requirements, and designs emerge from self-organizing teams" (Beck et al., 2001b). Flewelling (2018, pp. 20–23) states, that the individuals within the project know how to get the job done, so minimizing limitations and micro-management, and trusting them to get the job done will deliver the best outcomes. He adds that giving the people closest to the development the freedom to be dynamic and self-organize, will guarantee better results. Agility is also supported by the sixth principle, which focuses on interaction between individuals: "the most efficient and effective method of conveying information to and within a development team is face-to-face conversation" (Beck et al., 2001b). No form of communication can establish as much mutual understanding, and transmit as much information as face-to-face conversation, so it is the most endorsed method of communication in an agile software development project (Flewelling, 2018, pp. 20–23).

As stated in figure 2, the first and of the highest priority within the list of principles, is "to satisfy the customer through early and continuous delivery of valuable software" (Beck et al., 2001b). According to Measey (2015, p. 103), delivery through increments is the most efficient way of ensuring that the functionality being built is exactly what will satisfy the customer's need. Measey adds that facilitating early feedback through enabling the client to see and use the software that has been built will decrease the amount of work being done later on, and thus, increase customer satisfaction. The third and seventh principles; "deliver working software frequently", and "working software is the primary measure of progress", have the same emphasis on the importance of continuous delivery (Beck et al., 2001b). The client in the project is the one who decides when the functionality being built has reached the definition of done, and only then can the

development team be confident that they have built it correctly (Flewelling, 2018, pp. 20–22). As an addition, paying attention to the ninth and tenth principles; "continuous attention to technical excellence and good design enhances agility", and "simplicity, the art of maximizing the amount of work not done" (Beck et al., 2001b), increase the capabilities to create improvements to the product through implementing consistent development methods, building simple yet elegant solutions, and by being attentive with details (Flewelling, 2018, pp. 23). These aforementioned principles can be seen as guidelines for the agile value "working software over comprehensive documentation", highlighting the significance of continuous, high-quality delivery (Beck et al., 2001b).

The third value created for the Agile Manifesto, "customer collaboration over contract negotiation", is backed by the principle, "business people and developers must work together daily throughout the project" (Beck et al., 2001b). Flewelling (2018, p. 21) emphasizes that for the client to get the best outcome possible, they must be just as involved in the development as the development team. He adds that when creating an intricate and complicated information system, there is no chance that individuals of a single delivery discipline, such as coders or analysts, can successfully deliver working solely amongst themselves. Flewelling specifies that even though the coders are experts at building the software, and the business analysts know exactly how to fill the client's need, all of this knowledge and expertise will not be conveyed as value into the created software, if there is no collaboration between the business-people and developers. Measey (2015, p. 112) supplements that in the modern, rapidly changing business environment, daily collaboration is a necessity, in order to allow the continuous evolving of business needs, scope, timeframes etc. Measey adds that as these aspects of the project are adapted to the changing environment, the team needs to adapt as well. This is where the twelfth principle, "at regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly", becomes important (Beck et al., 2001b). Creating a habit out of consistent reflection into the team's latest iteration, including the team's approach, lessons learned, successes or lack thereof, will lead the team to a path of continuous improvement (Flewelling, 2018, p. 24).

Finally, expanding the fourth value of the Manifesto, "responding to change over follow-ing a plan", is the second agile principle: "welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage" (Beck et al., 2001b). Flewelling (2018, p. 20) emphasizes that resisting change and ad-hering to a previously set solid scope, timeline, and business need, when the environ-ment is dynamic, will likely lead to obsolete results. Embracing change by making it a fundamental element of the process, and quite literally being agile, will enable corrective measures before it is too late, generating exceptional value for the client (Measey, 2015, p. 114.).

2.1.3 Agile software development methodologies

Abiding to variable levels of the Agile Manifesto's values and principles, a variety of agile methodologies emerged in the early days of agile, and were adopted in the software development communities, and are still relevant and popular to this day (Dingsøyr, Nerur, Balijepally, & Moe, 2012, p. 1213). Some of the most well-known methodologies include for example Scrum, Kanban, eXtreme programming (XP), Crystal, Scaled Agile Framework (SAFe), and Adaptive Software Development (ASD). According to the 14th annual State of Agile survey (VersionOne, 2020), Scrum reigns as the supreme agile methodology, with 75 percent of agile consultants, practitioners and executives utilizing Scrum, or a Scrum hybrid. In the field of scaling agile, SAFe is the preferred methodology, with 35 percent of respondents in practice of it (VersionOne, 2020). In the following chapters, the agile methodologies Scrum and Kanban will be discussed in detail.

2.1.3.1 Scrum

Scrum is an agile project management methodology based on iterative and incremental development, and although it is exceedingly popular as an agile software development

framework, it can also be utilized in a variety of other types of endeavors (Holcombe, 2008, p. 15). Measey (2015, pp. 131–132) encapsulates transparency, inspection, and adaptation as the foundation upon which the methodology is built on. He describes these three "pillars of empirical process control" (p. 131) as transparency referring to providing clarity to each individual involved in the project, inspection referring to continuous assessment to how the project is proceeding, and adaptation referring to adapting processes according to changes in order to reach objectives.

Flewelling (2018, p. 39) highlights, how the Scrum team has specific roles for the actors in the project, and the team size is an essential aspect of the methodology. He emphasizes that as transparency is one of the founding pillars of Scrum, so large teams are unsustainable as it can get challenging to maintain transparency. According to the methodology, a Scrum team size of five to nine individuals is recommended, so team-wide clarity can be sustained (Flewelling, 2018, p. 39). Measey (2015, pp. 132-133) defines the team consisting of three separate roles given to all stakeholders and actors in the project: the Scrum master, the product owner, and the development team. He describes that the Scrum master's role is to lead the team to successful development through continually motivating and coaching the team and applying the methodology to iteratively assess progress and adjust accordingly. Measey adds that the second role, the product owner, has the responsibility of keeping the product backlog in order, meaning the actor in this role identifies which features will be developed and in which sequence. Finally, he expands that the rest of the team are the individuals who take shape of the third role, the development team. These individuals deliver the features as arranged by the product owner, and determine how the features are delivered, and within which timeframe (Measey 2015, p. 133).

The Scrum framework adheres to a certain process, consisting of defined artifacts, which are the product backlog, sprint backlog, and increments, and activities, which are backlog refinement, sprint, sprint planning, daily scrum, sprint review, and retrospective (Measey, 2015, p. 135). The first artifact, the product backlog is defined by Measey as a

"lean and transparent requirements model" (p. 136), which includes value-adding work items ranked by the product owner in the Scrum activity known as backlog refinement. As stated by Flewelling (2018, pp. 41–45) in a meeting called the sprint planning, from the product backlog, items are chosen, or "committed to" in the sprint backlog, starting the incremental development activity known as a sprint. He clarifies with the sprint most often being a two week-long cycle, where the items that were committed to in the afore-mentioned sprint planning, are developed and tested. He adds that the progress is fol-lowed by daily stand-up meetings, daily scrums, and in the end of the sprint, the devel-opment and the created value is examined in the sprint review, and processes of the team are examined and adapted in the sprint retrospective. This entire iteration results in the creation of fully functioning software known as an increment, the final artifact in the Scrum methodology (Flewelling, 2018, p. 41).

2.1.3.2   Kanban

Kanban is a software development methodology based on lean principles, meaning that it focuses on reducing waste through "value orientation, then reducing unnecessary fea-tures, improving the interfaces, empowering the software developers and continuously improving the solutions" (Tanner & Dauane, 2017, p. 178). According to Tanner et al. (2017) Kanban has gained popularity in the industry by its visually efficient controls, be-ing so simple to apply to ongoing projects and its consistent pursuit of endless improve-ment, among others. The authors add that in comparison to other agile methods, Kan-ban relies on more adaptive processes, instead of prescriptive as it "only introduces con-straints related to the visualization of the workflow and the limiting of Work in Progress" (p. 182). Flewelling (2018) introduces the four main practices of Kanban, which will be discussed in the following chapters.

Flewelling (2018) identifies the first main practice of Kanban as visualizing the work of the team through implementing a Kanban board (figure 3). Flewelling adds, that the Kan-ban board is a tool used in the methodology to visualize workflow, including work that is

to be done, work that is in progress, and work that has been finished. The number of work tasks for each column is restricted, which introduces a "pull system" as completed work tasks "pull" other tasks from the preceding column as it moves on to the following one (Tanner et al., 2017).

To-do	In Progress	Done
User story defined	Automated tests written	Acceptance tested
Estimation done	Review done	
Initial user scenarios	(Max 4 items)	Ready to release
Task	User story	User story
User story	User story	User story
Bug	Bug	User story
User story		Bug
User story		Task
Task		Task
Bug		

Figure 3. A simplified Kanban board (Adapted from Flewelling, 2018, p. 61).

The second main practice identified by Flewelling (2018) is creating explicit work policies for the team. This practice increases transparency in the development processes through the creation of documentation which dictates the policies and criteria for

entering/exiting a column on the Kanban board (Measey, 2015). These policies introduce the Definition of Done (DoD), which can be seen as guaranteeing that the work task has been acceptably finalized through a specific checklist e.g., the criteria in each column on figure 3 (Tanner et al., 2017).

The third practice related to the Kanban methodology is to improve and manage flow of work items, in order to create value by efficient delivery of software (Flewelling, 2018). According to Flewelling (2018), as an alternative of creating value through iterations, the Kanban methodology focuses on "optimizing the flow of work items through the system" (p. 63), which is where the "pull system" becomes vital. Flewelling states that as a replacement for pushing work tasks through the system causing "logjams" on the board, pulling the work tasks as capacity is released, results in an optimized end-to-end delivery process. Measey (2015) adds that "transitions between process steps in the workflow are monitored and measured" (p. 150) which, when analysed may provide openings for improvement and deliver insights to tell if previous changes have led to improvements.

This brings us to the fourth practice identified by Flewelling (2018), which is continuous improvement of processes once the Kanban methodology has been implemented. This includes constant agile adaptation of processes through feedback loops, which are clarified by Tanner et al. (2017, p. 183) as the following: "change something, find out how it went, learn from it, and change it again". This supports and encourages a culture of learning, where each individual within all levels of the organization can feel inspired to create changes and improvement (Measey, 2015).

2.2   Offshore software development

The accelerating globalization in the modern software industry has resulted in the transformation of traditional software development practices, as the industry is driven towards a more geographically diverse business environment (Korkala & Abrahamsson, 2007). According to Holmstrom et al. (2006), in traditional software development

endeavours, most of the stakeholders involved in the project are usually co-located with no major differences in time-zones or cultures among teams. The authors add, that in an ideal software development setting, cooperating teams would be in continuous real-time collaboration with consistent in person meetings and a shared organizational culture. In the pursuit of business advantage, most large software companies have been driven to practice offshore development, signifying that the development is carried out by a team, or teams in remote lower cost countries (Moe, Smite, & Hanssen, 2012). As the geographical distance between teams grows, new challenges are introduced to the traditional software development processes (Holmstrom et al., 2006). In the following chapters, the concept of offshore development will be presented, as well as the benefits and challenges that are often accompanied with it.

2.2.1   The concept of offshore development

According to Bass (2016), in the field of information systems offshore development is an increasingly attractive method of gaining financial advantage and a larger labor pool by transferring development to lower cost countries. Bass adds that the teams in collaboration with one another in offshore ventures are often divided by "significant temporal and cultural distance" (p. 2), indicating potentially major differences in time zones, languages, values, and business cultures. According to Rajkumar and Mani (2001), in the modern offshoring business the leading supplying countries are India, the Philippines, and several countries in Eastern Europe, with Indian companies dominating the business with a substantial portion. They elaborate the reasons for India gaining their leading position, by the country having a vast supply of educated developers with English as their language of business, and the efforts of the local government to transform India into a "center of information technology" (p. 63), among others.

Practicing offshore development has several potential benefits, out of which Ó Conchúir et al. (2006) recognize a few major ones that are pursued by software companies. They acknowledge reduced development costs as the leading driver for businesses to utilize

offshoring, as transferring development to lower wage economies may diminish salary charges to a fraction of the original costs. The second potential advantage, according to the research by Ó Conchúir et al. (2006), is the possibility of leveraging the differences in time zones, to increase working hours within a single day. The authors elaborate, that this is also known as "follow-the-sun development" (p. 61), where difference in time is leveraged so that developers on one site are working, when developers on another site and time zone are sleeping. Ó Conchúir et al. (2006) highlight the potential of accessing a greater labour pool with a specialized skillset as one of the main benefits of offshore development. The study indicates that in countries such as Malaysia or India, such a vast access to skilled developers facilitates software projects to "increase greatly the size of their development efforts without dramatic changes to the organization" (p. 63).

According to Moe et al. (2012), offshore development ventures can be implemented by either outsourcing development to third-party suppliers, or by establishing in-house off-shore development facilities in remote locations. Offshore outsourcing is elaborated by Moe et al. as "sub-contracting to third party vendors from other countries" (p. 1), which has become a common tool in modern software development projects. Moe et al. add, that in contrast, offshore development can be implemented in-house, signifying "collaboration within the company boundaries" (p. 1), where a development facility within the same organization is established in another country. Outsourcing has been the greater trend in the matter of offshore development, but recent studies suggest that the high number of unsuccessful outsourcing endeavours has resulted in in-house offshoring becoming the more attractive approach (Moe et al., 2012). The varying types of sourcing arrangements can be seen in table 1, where the sourcing option of in-house offshoring is framed in bold lines.

Table 1. Different sourcing options (Adapted from Moe et al., 2012, p. 2)

	Local	**Remote**
Different company	**Local outsourcing**	**Offshore outsourcing**
Same company	**In-house**	**In-house offshoring**

2.2.2 Challenges related to offshoring

In their research paper, Höfner and Mani (2007) stress, that in software development endeavours where offshoring is utilized, high quality communication, cooperation, and control are an essential requirement. They emphasize that a "relationship based on compatibility, trust and mutual respect between the client and offshore partner" (p. 162) is the key to success, and that "the three pillars on which an offshoring relationship rests are communication, coordination and control" (p. 162). As cooperative teams are distributed globally, new challenges arise related to these success factors. Holmstrom et al. (2006) identify three types of distance that effect the three pillars: temporal distance, geographical distance, and socio-cultural distance. These three so-called pillars of an offshoring relationship, along with the three types of distance affecting them are discussed

in the following chapters, with the main impacts categorized and visualized in table number 2.

Table 2. Impacts of distance in an offshore project (Adapted from Holmstrom et al., 2006).

	Distance dimension		
	Temporal	Geographical	Socio-cultural
Communication	Reduced opportunities for real-time communication, weakening it's quality. Asynchronous interaction methods increase complexity, resulting in delays and frustration.	Increased cost and logistics of holding face-to-face meetings. Lack of "teamness".	Risk of misunderstandings.
Coordination	Increased coordination costs.	Reduced informal contact can lead to lack of task awareness.	Inconsistency in work practices can impinge on effective coordination, as can reduced cooperation through misunderstandings.
Control	Asynchronous communication methods might result in delays.	Difficult to convey vision and strategy.	Different perceptions of authority/hierarchy can undermine morale.

Höfner and Mani (2007) identify communication as the most important factor out of the three pillars, as it is also an enabling element for successful coordination and control. They elaborate that in offshoring, communication is the act of remote teams achieving an understanding through trading information. Ågerfalk et al. (2005) explain that the process of communication comprises of the delivery and trade of information and knowledge between individuals, and the channels or tools that are in use to enable it. The authors emphasize that efficient communication is crucial in software development, so as distance between actors in the project grows larger, more care and attention must be paid to it. They add that the bandwidth, or efficiency of communication becomes limited as the optimal tool of communication, face-to-face, is not an option. Höfner and Mani (2007) find communication in offshoring quite problematic, as in practice the teams with varying organizational cultures, ways of working and communicating will likely find it challenging when trying to work together with a goal of delivering products that require intense coordination.

The second pillar, coordination is defined by Höfner and Mani (2007) as attempting to reach the main objective through incorporating and organizing individual development tasks to the different teams within the project. They add that succeeding in coordinating tasks typically entails strong and continuous communication among the teams separated by distance, as the actions and tasks by each actor are dependent on the activities of other actors. All types of projects with individual actors and interdependent tasks require coordination, but as teams are divided by great distances and tasks are spread out temporally and geographically, the necessity of quality coordination reaches its peak (Ågerfalk et al., 2005).

Finally, as the third pillar of a successful offshoring relationship, Höfner and Mani (2007) define control as abiding by the objectives and set timelines, which need to be followed to reach successful outcomes. Ågerfalk et al. (2005) specify that control processes entail ensuring that development activities are advancing through monitoring reporting and management tools. Ågerfalk et al. add that the control aspect of project management at

the different sites grows more challenging, as distance increases the difference in time between teams.

2.2.3 Temporal distance

In their research Holmstrom et al. (2006) identify three specific impacts of distance, that bring challenges to communication, coordination, and control in an offshoring endeavour. They define the first type of distance as temporal, indicating "a measure of the dislocation in time experienced by two actors wishing to interact" (p. 4), which can be caused by differences in time zones or work schedules. The research argues that temporal distance between teams decreases possibilities for individuals to have real-time cooperation, which has a potentially significant impact on the quality of communication. Höfner and Mani (2007) exemplify, that the time difference of 3,5 hours between teams in India and Germany results in the temporal overlap between teams' work schedules being relatively low. Holmstrom et al. (2006a) add that in projects with multiple sites the coordination and control aspects of managing the project becomes more and more challenging and expensive, as the number of sites, and the distance between them grows larger. Höfner and Mani (2007) elaborate, that asynchronous interaction methods (e.g., email) in place of real-time communication increase complexity, resulting in delays and frustration. Holmstrom et al. (2006b) add that the difference in time forces individuals to go the extra mile and uphold communication late at night, outside of regular office hours. This might be possible to uphold occasionally through intense phases in the project but sustaining it for longer periods of time may become exhausting, resulting in burnouts.

2.2.4 Geographical distance

The most evident type of distance identified by Holmstrom et al. (2006a), is geographical distance, which is defined as "a measure of the effort required for one actor to visit

another and can be seen as reducing the intensity of communication" (p. 4). The authors emphasize, that this type of distance should be quantified by "ease of relocating rather than in kilometres" (p. 4). They elaborate that among others, the necessary travel permits in combination with the convenience, time and money spent in travel have a relative effect on the experienced distance between teams. Höfner and Mani (2007) expand, that as sharing the same environment and in person communication are not feasible, the quality of communication and collaboration are reduced, and so is the ability to solve problems as a unified team. According to Holmstrom et al. (2006b, p. 12), the phenomenon of "teamness", or working as a unified team and forming the feelings of belonging and trust, may often be impacted by geographical distance. The authors add that even though there are enablers, such as communication technologies that facilitate teamness, individuals within the same team, but divided by geographical distance may experience a feeling of being in separate teams.

Ågerfalk et al. (2005) describe the lack of informal contact as one of the most major issues related to geographically divided teams. They expand that "in co-located teams, informal contact, aka 'coffee talk', can account for about 75 minutes of the working day" (p. 52), and it enables an efficient information flow, which is not likely to happen in geographically divided teams. The authors add that it may often lead to a lack of task awareness, as geographical distance diminishes the chances for informal contact. In addition, the cost and logistics of meeting face-to-face with the remote team can be increased tremendously, according to Ågerfalk et al. (2005). The authors add that "sometimes, meeting remote colleagues face-to-face is indispensable, especially in the early phases of a project" (p. 53), which can prove to be not only very time-consuming, but quite expensive.

2.2.5   Socio-cultural distance

The third and final type of distance identified by Holmstrom et al. (2006a), is socio-cultural, which is a particularly complex dimension of distance that can be experienced in

offshore projects. The authors define it as "a measure of an actor's understanding of another actor's values and normative practices" (p. 4), which may have a tremendous impact on how individuals respond and interpret the situations they face. Holmstrom et al. expand, that among others, socio-cultural distance comprises of "organisational culture, national culture and language, politics, and individual motivations and work ethics" (p. 4). The authors emphasize, that even when the geographical distance between individuals may be substantial, it does not inevitably imply that their socio-cultural distance is significant as well. They expand that the differences in national cultures may not pose a threat to the pillars of an offshoring relationship if the individuals share common features of organizational cultures.

Ågerfalk et al. (2005) define differences in language and potential misunderstandings as one the biggest steppingstones related to socio cultural distance. The authors expand that accents and dialects can generate misunderstandings, even if the individuals in the project are fluent in the language commonly used. In addition, differences between teams related to inconsistencies in work practices, and cultural differences in authority and hierarchy are known to cause problems in socio-culturally divided teams.

3 Case context and research methodology

In this chapter, the research methodology is discussed. The following chapters discuss the case context to provide a clear context of the research, and the research methodology, including methods of data collection and data analysis.

3.1 Case context

For the case of this empirical research was chosen a multinational company, which specializes in information technology services. The case company has several office locations around the world, including Helsinki and a few others in Finland, but it is not based in Finland. The case company has several in-house offshore software development locations, which can be utilized in software development projects with clients around the globe. No specific project or team was chosen for this study, as the aim was to reach varying levels of experience and job titles with different backgrounds, to ensure diverse findings. The size and the field of business of the projects in which the case company is involved with varies.

The goal of attaining interviewees was to reach professionals with a high amount of experience in projects utilizing in-house offshore development, but with varying backgrounds in terms of job titles and experience. Interviewee experience in the field of offshore development is of high importance to provide valid and reliable results, so close attention to the interviewees and their experience was paid, especially when the sample size is relatively small. Diversity in the interviewees' backgrounds can provide varied perspectives into the research, so diversity was pursued when reaching out to possible candidates.

All of the chosen interviewees worked for this same multinational company specializing in information technology services. The interviewees' job titles varied from business analysts and scrum masters to project managers and upper-level management. The

amount of experience with offshore development time-wise varied from a few, to over ten years, often with several different projects along the way. Most of these projects were carried out in-house. The team size of the projects the interviewees had experience in varied, but it was often between ten to twenty individuals. All of the interviewees had experience with India being the offshore location and a few had some experience with the offshore location in Latvia. All of the projects' clients were located in Finland. The interviewees had a wide range of experience regarding software development methodologies, ranging from the more traditional waterfall-method to modern scaled agile frameworks. Most common methodologies, with which all of the interviewees had experience were Scrum and Kanban, or hybrids combining features from these two, or other methodologies.

3.2   Method

Myers (2017, p. 6) defines research in a university setting as "original investigation", which has the goal of creating new knowledge and understanding in the specific field of research. He expands that research is characteristically carried out by individuals with explicit knowledge about the field of study, and that it "typically involves enquiry of an empirical or conceptual nature" (p. 6). According to Myers (2017, p. 7) the types of research can be categorized in different ways, but the most common way to define research methods is by the classification through quantitative and qualitative research methods.

Myers (2017, p. 8) defines quantitative research as a method of studying natural phenomena developed in the field of natural sciences research. He expands that quantitative research methods accentuate numbers, and that they include for example mathematical modelling, laboratory experiments, and survey methods. Myers adds that the "numbers represent values or levels of various theoretical constructs" (p. 8) which are used as evidence to explain phenomena. Myers (2017, p. 9) states that quantitative research methods are fitting for studying a specific theme with a large sample size, when

trying to identify patterns and trends in a wide range of conditions. He reflects that quantitative research has a great disadvantage where the "quantitative researcher trades context for the ability to generalize across a population" (p. 9), meaning that cultural and social characteristics of people and organizations are overlooked as 'noise', and get easily lost in the quantitative research process focusing on numerical statistics.

In the search of explaining cultural and social phenomena, social sciences researchers developed the qualitative research methods, such as case study research, action research and grounded theory (Myers, 2017, p. 8). Myers (2017, p. 8) describes qualitative data as "mostly a record of what people have said", which can be collected through for example questionnaires and interviews, and participant observation. He exemplifies that in an interview, data can be collected by recording the interviewees thoughts and ideas, and by the researcher writing down field notes of the thoughts and points of the researcher. Qualitative research is labelled by Myers (2017, p. 9) as best fitting for investigating a specific subject or phenomena in depth. He expands that qualitative research is especially suitable for "exploratory research when the particular topic is new and there is not much previously published research on that topic" (p. 9), and for "studying the social, cultural and political aspects of people and organizations" (p. 9). The greatest disadvantage related to qualitative research, is that the small sample sizes make generalizations to a population from a sample quite difficult, if not impossible (Myers, 2017, p. 9).

When taking into account the advantages and disadvantages of quantitative and qualitative research methods, qualitative research was chosen as the approach of this thesis. As was stated by Myers (2017, p. 9) qualitative research methods are best for investigating a subject in depth, and that it is suitable for example studying cultural and social aspects, making it a very fitting method for the topic of this research. Out of the several different qualitative research methods, the method of case study research was chosen for this thesis.

The qualitative research method of case studies is simplified by Myers (2017, p. 91) as being "the description of a particular case or situation that is used to draw some conclusions about the phenomenon more generally". He expands that case studies aim to examine current phenomena in its realistic setting. Case study research can be divided into three approaches, namely positivist case study research, interpretive case study research, and critical case study research (Myers, 2017, p. 94). According to Myers (2017, p. 94) in the field of information systems, interpretive case study research is the most common out of the three. He describes the method as "interpretive case studies generally attempt to understand phenomena through the meanings that people assign to them" (p. 94). Out of the three approaches of case studies, the method of interpretive case studies was found to be the best fitting, and thus chosen for this thesis.

3.2.1   Data collection

Myers (2017, p. 145) labels interviews as one the best qualitative data gathering methods for researchers. He describes that the method of interviews enables the researcher to collect valuable information from individuals in varying roles, and that the interview method allows "us to see that which is not ordinarily on view and examine that which is looked at but seldom seen" (p. 145). Interview can be classified into three different types: structured interviews, semi-structured interviews, and unstructured interviews (Myers, 2017, p. 148).

Myers (2017, p. 145) describes structured interviews as following a strictly regulated questionnaire in a specific order and time limit, and unstructured interviews as its opposite, following no pre-formulated questions with no time limit. He defines semi-structured interviews as having the best of both worlds, which minimizes the risks associated with each. As stated by Adams (2015), the semi-structured interview method consists of a combination of standard, pre-written, and open, improvised questions often including follow-ups, such as how, or why, which results in a more comfortable and engaging interview that might end up with unpredicted findings. He adds that one-on-one semi-

structured interviews may be labour-intensive and tedious, but they provide superb re-
sults in gaining valuable thoughts and reflections from individuals, which is why it has
been chosen the data collection method of choice for this qualitative case study research.

As can be seen from appendix 1, the interview structure was divided into four sections,
which focused on interviewee background, and the three dimensions of distance de-
scribed earlier: temporal distance, geographical distance, and socio-cultural distance.
First, the study goals and themes were discussed with the interviewee, and in addition
full anonymity was assured. After this the interviewee background and experiences were
discussed, to identify what kind of offshore development experience the interviewee has,
including for example the offshore location, difference in time, the methodologies used
and so on. From there the discussion focused on each of the three distances, with a focus
on the interviewee's personal experiences about how the specific distance at hand im-
pacts each pillar of a successful offshore endeavour: communication, coordination, and
control. A clarifying question of how these impacts were mitigated in the interviewee's
experience was discussed with each dimension as well. The goal of each interview was
to go over each main theme of the questionnaire, and to not intervene too much if the
discussion deviated from the main theme or topic at hand. Some valuable thoughts and
ideas were uncovered as the interviews were experienced as a free discussion instead of
a strict questionnaire with time limits for each answer.

The potential interviewees were first contacted during the spring of 2021, and all of the
interviews were held during the summer of 2021, within about a three-week timeframe.
The interviews were held as one-on-one video calls through Microsoft Teams, and with
the interviewee's permissions, the discussion was recorded as an audio file, and in addi-
tion field notes were taken by the interviewer. All of the discussions were held in Finnish.
Each of the calls lasted about 35-45 minutes, which was just enough time to go over all
of the main discussion points of the interview, and also allow the discussion to drift a
little from the main topics, providing valuable insights. For this study, a total of seven
individuals were interviewed before reaching saturation, meaning that the data

collected from the interviewees comments starts to repeat itself, making further interviews unnecessary (Saunders et al., 2017).

3.2.2 Data analysis

According to Myers (2017, p. 205), in quantitative research a clear division can be made between gathering and analysing data, but this distinct division is not as simple with qualitative research methods. He expands that logically, the phase of data gathering is followed by the analysis-phase, but there usually is an iterative aspect to it, where the "analysis will affect the data and the data will affect the analysis" (p. 205). In qualitative research, Myers (2017, p. 205) emphasises the importance of paying close attention into the interpretation and analysis of data, as the qualitative data collection methods often result in vast amounts of data. He expands that qualitative data analysis approaches allow the researcher to collect and edit the data which provides substantial value to the research, and to discard the irrelevant information.

In the first phase of the analysis of the data gathered through the interviews, was to transcribe it, meaning that all of the seven interviews were written down into text form on a computer. The amount of transcribed information at its most raw form is massive, so the relevant and irrelevant data needs to be separated. In this research, the relevant data was identified and categorized through coding and thematic analysis, both of which are common qualitative data analysis approaches (Myers, 2017, p. 208). According to Myers (2017, p. 208), through coding the text can be cut down into smaller sections, and then categorized, or coded by adding a fitting label to the section. He adds that themes or categories can be identified from previous literature and research, to which the coded sections of data can be categorized. In this research the main themes or categories were based on prior research discussed in the background section.

As can be seen in table 3, the sections of relevant data were first categorized into the main themes identified in the background-section, which were the dimensions of

distance: temporal, geographical and socio-cultural. After this the section of data was then subcategorized into subthemes, which were the three pillars of a successful off-shore endeavour: communication, coordination, and control. For example, a quote from an interview stating, "some timeframes in late afternoons when the offshore colleagues can't be reached causes frustration", was first identified as being a problem caused by temporal distance. Next, the quote was subcategorized by identifying that this issue causes problems in the pillar of communication.

All of the transcribed interviews were read through several times, and the relevant data points were picked out and coded as described above. Microsoft Excel was used as the main tool to create a matrix of the distances and pillars, to which all of the relevant quotations were added into the fitting slot, providing a visual representation of what problems are caused by which distance, and which pillar is impacted. The matrix was constructed to be similar with table 3, which was mentioned earlier in this study. When a quote with matching data to an earlier quote was discovered, such as the two bottom quotes in table 3, a marking was made to the matrix. The marking showed that this finding has been experiences by two or more interviewees, reinforcing the validity of it. In addition, as these markings started to increase and no new findings were being made through the interviews, it was clear that saturation was being reached. This means that the data collected from the interviewees comments starts to repeat itself, making further interviews unnecessary (Saunders et al., 2017). The relevant findings were then written down and compared to previous research. This study provided findings which had been discovered in earlier research, but some new findings were made as well. These study findings will be described in detail and compared to existing research in the following sections.

Table 3. Examples of the data categorization process.

Quote	Main theme (Dimension of distance)	Subtheme (Which pillar is affected)
"Coordinating meetings can be difficult in certain timeframes during the day."	Temporal	Coordination
"Some timeframes in late afternoons when the offshore colleagues can't be reached causes frustration."	Temporal	Communication
"As there is no informal contact, it is hard to keep up with al of the project tasks"	Geographical	Coordination
"A certain lack of ownership in work tasks was experienced due to no direct contact with the client."	Geographical	Control
"Differences in spoken English can cause massive issues"	Socio-cultural	Communication
"Different dialects of spoken English can be hard to understand, which causes problems especially in the beginning"	Socio-cultural	Communication

4   Research findings

In the following chapters the findings of the empirical research will be presented, with categorization into the three dimensions of distance, and to which pillar is impacted by the dimension of distance.

4.1   Temporal distance

As previously mentioned, temporal distance or the "measure of the dislocation in time experienced by two actors wishing to interact" (Holmstrom et al. 2006a, p. 4) is caused by differences in time zones or work schedules. This type of distance often impacts the quality of communication, resulting in frustration and delays. In this study's case the most common offshore location was India, which has a 2,5-3,5-hour time difference to the onsite location of Finland. The difference in time varies by an hour depending on the time of year, as in Finland daylight savings time is used. The other, not as common off-shore location of Latvia has the same time zone as Finland, so in this case the only type of temporal distance that had an impact is related to work schedules, and not difference in time zones.

Through the interviews it was found that the temporal overlap, or the hours during which both onsite and offshore locations are working simultaneously, is surprisingly high in the case of India being the offshore location. Even though the time difference can be relatively high, it is possible that from the onsite point of view, the offshore team can be reached throughout the working day with neither location having to stretch outside reg-ular office hours. This is partly the result of differences of working cultures, as in India it is common to start the working day a few hours later than in Finland, and the typical working day is 9-10 hours, so quite a bit longer than the onsite team's. This significantly mitigates the potential impacts of temporal distance between teams, but still it was found that it is not uncommon for individuals having to stretch outside of regular office hours every now and then.

Quite unexpectedly, even though Latvia and Finland have no difference in time zones, when comparing the temporal distance between India and Latvia, it was noticed that the temporal distance was more prominent in the case of Latvia being the offshore location. This was again the result of working cultures, as in Latvia it is also common to start the working day at a later hour. In this case, there is no difference in time zones to alleviate the dislocation in time, resulting in overlapping working hours being relatively lower.

4.1.1 Communication

When focusing on the impacts of temporal distance, it was found that the interviewees believed it to have a surprisingly low effect on the quality of communication. This is partially the result of the offshore locations in question having a fairly low, or even non-existent difference in time zones. It was noted that a greater difference in time would be more relevant. An exemplary case came up with the USA and India being the locations, where the overlapping working hours can be potentially non-existent, as the time difference can be greater than the length of a typical working day.

Even if the impact of temporal distance on communication was observed to be lower than expected, it did still produce some issues. An interviewee stated how "the relatively short time frames in the morning or in the afternoon when the other location may not be available potentially causes inconvenience". This thought was common with most of the interviewees. Naturally, when the other location can't be reached, the efficiency of communication and thus the ability to advance work items is decreased, causing delays and frustration. This is where all three success factors of an offshore endeavour are impacted, as was voiced by a respondent that "efficient coordination and control rely on successful and continuous communication". Practically all of the interviewees established how the impact of temporal distance on communication is significantly mitigated by modern communication technologies and agile methodologies. An interviewee acknowledged how "daily scrum-meetings, Kanban boards, Microsoft Teams, among others facilitate easy communication, so it is not always necessary to ask individuals

what they are doing and how the task is progressing". Communication technologies, such as Microsoft Teams were commonly used in the projects the interviewees had been a part of, which enable high bandwidth, real-time communication through video calls and instant messaging, alleviating distance between individuals. In addition, it was discovered that agile methodologies and their processes, such as daily meetings with the entire project, including onsite and offshore personnel typical to the Scrum-methodology, support continuous communication.

4.1.2   Coordination

When it comes to coordination, it was found in the study that temporal distance does not have such a distinctive impact, other than a small issue stated by a respondent, that "coordinating meetings in the early mornings or late afternoons, with both parties, on-site and offshore present is not always possible". More notably, the significance of agile methodologies and tools was stressed by some of the interviewees: "tools such as the Kanban board and project tracking platforms, such as Jira make a huge difference. Without them it would be extremely difficult to coordinate an offshore project". These modern agile tools were noticed to enable efficient coordination, making it possible to follow the progress of work items when the team members in the other location might not be reached. Especially the visual tools, in this case the Kanban board was found to be particularly useful in coordinating work tasks in a project with multiple locations. A fitting proverb came up in an interview, saying: "a tool is only as good as their user", suggesting no matter how good or efficient the tools being used are, if the user can't operate them correctly. This being said, according to an interviewee, "it is not uncommon for individuals in the project to forget updating the status of work items", which reduces transparency, and in turn complicates coordination.

4.1.3   Control

The findings of the study suggest that control, or the ability to adhere to set goals including objectives and timelines, is affected in a detrimental way as temporal distance between teams is increased. As was discovered when focusing on communication, several interviewees found that the short time frames early in the morning or late in the afternoon, when individuals in the other location can't be reached, caused difficulties in abiding by set timelines. An interviewee recognized, that "these difficulties were caused by infrequent incidents, where for example a certain task must be finished by the end of the day, but the offshore location may already be pushing well over regular office hours". They expanded that "it is quite problematic and discouraging to demand individuals at the offshore location to stay available past regular office hours when the onsite team is still a few hours from going offline". This was found to have a negative impact on teamness, or the feeling of trust and belonging, so a respondent stressed, that "the difference in time between sites must be considered when setting goals and timelines". A small silver lining was noted in the interviews regarding the offshore location starting their working day earlier than the onsite personnel or clients, where the difference in time or working schedules may provide an advantage: "when the offshore location potentially has a few hours lead in the mornings, some specific tasks such as package delivery to the client can be done in advance". This way the package is ready for the client to install as soon as they start their working day.

4.2   Geographical distance

Geographical distance was defined as the "measure of the effort required for one actor to visit another" (Holmstrom et al., 2006a, p. 4), signifying the relative ease for an individual to visit the corresponding location in an offshore endeavour. As mentioned above, the geographical locations of the offshore teams in this study were in India and Latvia, which have quite a remarkable difference in the ease of relocating to from the onsite location of Finland, or vice versa. Visiting the offshore location in Latvia was described

by an interviewee as being "as easy as it gets, all it takes is an hour-long flight, with no time difference or laborious bureaucracy necessary for travel permits". This made frequent short trips feasible, and it was common to visit the offshore location a few times monthly.

In the case of India being the offshore location, the effort required to visit can be considerably high, making it challenging to visit often. An interviewee described visiting the Indian offshore location as "exhausting, but worth it". They expanded, how much effort these visits require to visit the location, as "two long flights overnight and a few hours long taxi ride from the airport". In addition, they described how "acquiring the proper travel permits can be laborious". These factors make short and frequent visits unfeasible, so typical visits would often last from a few weeks to a couple months, and they would be arranged at most once, or twice yearly. These visits were arranged in both directions, with onsite personnel's visits to the offshore location in India commonly lasting about two weeks, and visits from the offshore location to Finland lasting a bit longer, up to two months.

In some projects it was also common to bring representatives from the Finnish client to the offshore location every now and then. A respondent described how "these client visits at the offshore site were found to build trust in the client and were used to demonstrate the ability to accomplish project tasks, even when a part of the team can be separated by such a great distance". Not only do the client visits leave a positive impression with the client representatives, but they also have a great significance with the individuals in the offshore location meeting with the client. In an interview it was discovered how "the team members in India typically have no direct contact with the client of the project, so they might be in the dark of who the client is and what they really do". Meeting representatives from the client face-to-face was found to build teamness and a certain type of ownership to the work that they are doing for the client.

A few other issues related to geographical distance came up in the interviews. One of the interviewees noted that "it is quite expensive for the company to arrange these visits, especially to the Indian offshore location". They added that "on the other hand, these investments pay themselves back, as they have so many benefits". The question of sustainability was brought up as well: "sustainability is such a major theme in the modern business landscape, that the impact of these long flights must be considered in the near future". In addition, the challenges related to data protection regulations were noted, which were found to be a potential problem when the offshore team is separated by such a large geographical distance. An interviewee noted that "the client's information systems being worked on by the offshore personnel might contain very personal and sensitive data of Finnish citizens, so certain safety measures need to be taken to address this issue".

4.2.1 Communication

Ågerfalk et al. (2005, p. 52) described face-to-face communication as "the basic prototype for communication, and generally considered the best means of exchanging ideas". This was also the general consensus among the interviewees, which was voiced by an interviewee that "face-to-face communication has the highest broadband, and it is the method of choice in these types of projects". Of course, this is not always possible, especially when the geographic distance between teams can be as high as in the cases of this study. Most of the interviewees found communication fairly challenging; "especially when starting out in a new project with new people, when team members are divided by great distance". An interviewee noted that "the feeling of teamness and building it can be difficult when a part of the team is so far away". The challenges were noticed to smoothen out over time, as work tasks are carried out together, and problems are solved as a team. All of the interviewees experienced that "as teamness and trust between individuals is built, the easier communication becomes". In addition, modern communication technologies were found to increase efficiency and ease of communication.

Visiting the corresponding location and meeting the individuals there was discovered to be exceptionally beneficial to building the quality of communication. This was expanded by an interviewee that "even when the communication from there on would be carried out through a technological medium, the newly built trust does wonders to the quality and ease of communication". The interviewees found that getting to know your team members in the offshore location made it effortless to communicate face-to-face, consequently making upcoming communication through communication technologies easier after returning from the trip.

4.2.2   Coordination

The data gathered through the interviews shows, that geographical distance has a detrimental impact on coordination in an offshore development project. The interviewees found that as it is not possible to always be co-located with all of the actors in the offshore site, the lack of informal interaction could lead to obstacles in efficient coordination. An interviewee noted, how "when co-located, it is so effortless to spontaneously ask a colleague the quick status of a certain task, which unfortunately is not as straightforward in an offshore endeavour". In contrast, a thought came up that co-location may lead to micromanaging, meaning continuous observing and controlling by managers. A respondent noticed how "the absence of micromanaging might be a hidden advantage in offshore endeavours, but this of course depends on the managers in each project". This highlights the importance of trust and ownership in the tasks that are carried out by individuals, so that they are truly progressing, and their status is updated accordingly to the project management tools. Once again, the significance of agile methodologies and tools, and especially "the actors' ability to utilize them correctly" was stressed by the interviewees. The agile practices typical to the Kanban methodology, such as explicit formality and transparency through common policies and terminology were discovered to enable precise and efficient coordination.

4.2.3 Control

As was found in the two prior pillars of a successful offshore relationship, control was observed to being more complicated when comparing to an entirely co-located team. Through the interviews it was found that increased geographical distance produces more challenges, but once again they were significantly mitigated through the efficient implementation of project management technologies and agile practices. The interviewees, especially those who had experience in managerial positions in offshore endeavours, reflected that "trust and common policies had a critical role in sustaining control, when it is not viable to be co-located". Some experienced that if an individual in the offshore location stated that this certain task will be finished within a certain time frame, then it is not feasible to track the task's progress in real time. An interviewee stated that "you just have to trust the estimation to be true". They expanded that "here again lies the possibility of micromanaging, which should be avoided to uphold teamness and trust". In addition, some of the interviewees noticed that due to the individuals in the offshore location experiencing minimal direct interaction with the client, in some cases there may be a lack of ownership in the tasks being carried out. An interviewee voiced a thought that "neglecting work tasks may not be so evident when divided geographically, but on the other hand results speak for themselves". These potential issues complicate control in an offshore endeavour, as they are directly reflected in quality, budget, and schedules.

4.3 Socio-cultural distance

Socio-cultural distance was described as being an especially complex dimension of distance, which potentially has quite a large influence on the three pillars of a successful offshore endeavour. As may be expected, the data gathered through the interviews shows that the socio-cultural distance between the onsite location of Finland, and the offshore location of India is tremendous. When comparing Finnish and Indian working cultures and hierarchies, the interviewees observed large differences. In addition, the fact that the English language is not native for either country creates problems, as was

voiced by an interviewee that "successful communication, upon which efficient coordination and control lie upon, is endangered".

This distance was found to be mitigated by various factors. An interviewee in a managerial position voiced that "placing effort into maintaining long-lasting teams and relationships, where the individuals truly get to know each other and the culture of the other location" is a great tool. This was found to create a so-called cultural fit, which in turn helped in the creation of trust and teamness. A respondent experienced that "if the newcomers have no prior experience with collaborating with the culture of the other location, then continuously changing teams are non-functional". The interviewees observed that learning the intricacies of working with another culture, particularly when the differences are substantial, takes some time, so long-lasting teams and relationships were found to be very sought after. A great factor mitigating socio-cultural differences was that the offshore endeavour was implemented in-house, meaning that all the teams were within the same company. An interviewee expanded this by describing how "sharing a common organizational culture with shared customs creates a mutual foundation of values, which facilitates cooperation and interaction regardless of cultural differences". In addition, a respondent voiced a thought that "virtually all of the team members in both locations are, so to speak, selected and highly educated, intelligent individuals". This was found to add to the sense of shared values and experiences between team members, once again building teamness and thus, increasing the probability of success in the project.

4.3.1 Communication

A consensus among the interviewees was that "communication is the key to success, and that ideally, there should not be any socio-cultural obstacles inhibiting efficient communication between any of the team members in an offshore endeavour". In the end, this ideal situation was found to be unlikely, as there was observed to be quite many socio-cultural barriers impacting communication. In the case of India being the offshore

location, the language barrier was found to have quite a large impact. An interviewee experienced that "especially when starting in a project with an offshore location in India, the differences in spoken English might come as a shock". They expanded that "even though both parties might be proficient in the language, confusion is common in the beginning". The interviewees found that in the beginning misunderstandings may be common, but continuous collaboration facilitates the ease and efficiency of communication. "The importance of understanding the differing culture and its intricacies" was highlighted by a respondent. Certainly, good knowledge of the vocabulary in the field of business helps but it was voiced that "understanding what is actually meant when something specific is said, requires insight about the culture". This was found to cause issues in the project, as misunderstandings can cause delays. Most of the interviewees found it vital to aim for absolute clarity in one's own words, as it must not be subject to interpretation.

As has been stated previously, the direct communication between the project's clients and the individuals at the offshore location was found to be scarce and problematic. An interviewee had observed "a certain type of cautiousness with both the clients and the offshore personnel when collaborating". More often than not, the onsite employees would have to act as so-called translators, or intermediaries in collaborative sessions, even though everyone involved would be linguistically proficient for direct communication. A respondent voiced how "the clients and offshore personnel communicating in a more direct manner would be the most efficient resolution, but it has proven to be quite challenging to implement". In addition, the client's information system being developed often had user interfaces, documentation etc. in Finnish, making it more and more difficult for the offshore location to understand.

The interviewees noted how the Finnish culture of communication is very direct and absolute, which was found to contradict the more indirect and relative communication culture of India. Also, the Indian working culture was observed to be more hierarchical, which effects the likelihood and acceptability of individuals bringing out their true

opinions. An interviewee experienced that "when higher-ranking officers are present, it is not common for lower-level employees to bring out their differing ideas or opinions, as it might be seen as questioning their officers". Bringing forward new ideas and opinions were encouraged through agile processes typical to the Scrum methodology, such as retrospectives and one-on-one discussions, where it would be easier to bring up matters that cannot be stated in a larger group. In addition, an experience came up in the interviews, describing how "saying no to a higher-ranking officer, especially when he or she was Finnish, could be considered nearly unacceptable or impolite". Here the importance of trust was again accentuated by the interviewees, so that the individuals at the offshore location would find it comfortable and secure to speak directly. When comparing the communication culture of the offshore location of Latvia to the Indian culture, a respondent noticed how "it is much more 'Slavic', which could be found as almost crudely direct, which on the other hand is a better cultural fit to the communication culture of Finland".

4.3.2 Coordination

When focusing on how coordination is impacted by socio-cultural distance, the interviews established some issues, but nothing major that couldn't be conquered. An observation came up, related to cultural differences in proactivity, and being more self-directed. An interviewee noted that "in Finnish working culture it is more common to be proactive in keeping colleagues and project management tools updated about the task being worked on, and in addition it is encouraged to autonomously start working on the next prioritized item when available". On the other hand, it was observed that "in Indian working culture, onsite personnel would have to regularly ask about the status of work items, as it might not be proactively communicated in a direct manner, or through project management tools". This was found to cause frustration as it complicated the coordination of work tasks. Here the importance of absolute formality and transparency in the status of the work items, and the significance of the agile tools and how they're being used was again emphasized by the interviewees. The differences in hierarchy also came

up. This was voiced by a respondent as "in the Indian working culture it is more common to need approval from higher up to start working on a certain task". This was noticed to potentially cause delays, as receiving approval might take time to pass through the chain of command.

4.3.3 Control

As was discovered related to communication and coordination, socio-cultural distance was found to have a strong impact in the control of an offshore software development project. The interviewees found it quite common to have Indian offshore colleagues answer yes to nearly everything, and for example "promise the delivery of work tasks by a certain time, even though the item could not possibly be finished by said date". This type of occurrence was discovered to originate from the Indian working culture related to hierarchy and communication behaviour, where it is not acceptable to answer no, especially to higher ranking officers. An interviewee reflected that "when comparing to Finnish communication behaviour of absolute clarity and directness, the conflict is quite distinct". They added that "in the Finnish working culture deadlines are absolute, where Indian deadlines might be seen more as approximations". Another cultural issue impacting control, are the previously mentioned differences in the ability to be proactive, as in the Indian culture it is necessary to acquire approval from higher up to proceed with tasks. These issues were found to not only have an impact on timelines and budgets, but also on teamness, as it might result in deterioration of trust when promises are not underdelivered.

4.4 Summary of the findings

The summarized findings of the research can be seen in table 4. The main findings have been identified and categorized based on each dimension of distance, and its impact on

each of the three main pillars of a successful offshore relationship. The main findings will be discussed further in the following chapter.

Table 4. Summarized main findings of the research.

	Distance dimension		
	Temporal	**Geographical**	**Socio-cultural**
Communication	Short timeframes in early mornings or late afternoons when the other location can't be reached causes frustration. 'Overlapping' office hours, modern communication technologies, and agile methodologies mitigate difference in time.	Lack of face-to-face communication. Increased cost and logistics of holding face-to-face meetings. In the beginning communication is challenging with new people. Lack of teamness.	Language barrier causes problems, especially when starting in a new project misunderstandings are common. Direct communication between project's client and offshore personnel problematic. Communication cultures and differences in hierarchy impacts direct communication.
Coordination	Coordinating meetings difficult in certain timeframes. Modern tools facilitate coordination, but "tools are as efficient as their user".	Lack of informal contact leads to lack of task awareness. Chance of micromanaging is reduced when distance between teams is increased, the importance of trust is accentuated.	Cultural differences in proactivity and hierarchy have an impact on coordination.
Control	Short timeframes in early mornings or late afternoons when the other location can't be reached causes delays. Problematic to demand the other location to stay available after regular office hours.	Tracking a task's progress in real-time not feasible if not co-located. Lack of owneship in work tasks due to minimal direct contact with project client.	Differences in communication cultures and hierarchy in conflict, affecting deadlines, budgets and teamness.

5 Discussion

In the following chapter the findings of the research will be discussed, with a goal of answering the research question of

How do the dimensions of distance impact agile in-house offshore software development projects?

After this the limitations and potential future research topics will be presented.

5.1 Impacts of distance in agile offshore software development projects

The data collected through the research provides clear evidence, that the three dimensions of distance, namely temporal, geographical, and socio-cultural distances have a distinct impact in agile in-house offshore development projects. All of the three pillars of a successful offshore relationship, communication, coordination and control were found to be evidently affected by these aforementioned distances. Findings, which support earlier research were made, and in addition some new findings were made as well. Each distance will be discussed in detail in the following chapters, and the findings will be compared to pre-existing research.

5.1.1 Impacts of temporal distance

The first distance which was presented, temporal, was found to have a lower impact than expected, especially with the offshore location being in India, such an extended geographical distance away. As can be seen from table 5, previous research suggested that the quality of communication would be affected by asynchronous interaction methods resulting in delays and frustration (Holmstrom et al., 2006a). The data gathered by this research proves this to be mostly accurate, but not as great of an issue as described. The

temporal overlap was found to be higher than expected in the case of India being the offshore location. This allowed real-time communication with only short timeframes when the other location could not be reached.

Table 5. Comparison of impacts caused by temporal distance.

	Temporal distance	
	Pre-existing research	Findings of this study
Communication	Reduced opportunities for real-time communication, weakening it's quality. Asynchronous interaction methods increase complexity, resulting in delays and frustration.	Short timeframes in early mornings or late afternoons when the other location can't be reached causes frustration. 'Overlapping' office hours, modern communication technologies, and agile methodologies mitigate difference in time.
Coordination	Increased coordination costs.	Coordinating meetings difficult in certain timeframes. Modern tools facilitate coordination, but "tools are as efficient as their user".
Control	Asynchronous communication methods might result in delays.	Short timeframes in early mornings or late afternoons when the other location can't be reached causes delays. Problematic to demand the other location to stay available after regular office hours.

In the case of Latvia being the offshore location, the findings contradict previous research by Höfner et al. (2007), suggesting that time difference results in temporal overlap being lower. The findings of this research state that it was not the difference in time

zones which lessened the relative amount of overlapping working hours, as they are the same between Finland and Latvia. The reason for the lower number of overlapping hours was proven to be the difference in Latvian working cultures with regular office hours starting at a later hour than in Finland.

The aspects of coordination and control were described by previous research to be impacted by increased delays and costs (Höfner et al., 2007). These detrimental impacts were presented to be created through the obligatory use of asynchronous collaboration methods, as temporal distance between teams is increased (Höfner et al., 2007). These findings were confirmed in this research. Asynchronous coordination tools were found to be mostly effective, but often transparency was reduced when individuals would forget or neglect updating the status of their work tasks. Asynchronous communication tools, and certain timeframes when the other location can't be reached were found to cause delays and frustration. In addition, an issue was discovered, where teamness was found to be impacted in the rare occasions of individuals having to stay available after regular office hours, if a certain task must be finished within a specific timeframe.

5.1.2 Impacts of geographical distance

In previous studies when focusing on communication, geographical distance was characterised to cause a lack of teamness, and to increase costs and logistics of holding face-to-face meetings (Holmstrom et al., 2006a). Through this research, both claims were found to be factual. As is shown in table 6, the feeling of teamness and building it was found to be much more difficult when teams are divided by great distance. As time passes and continuous communication is upheld, the complications in communication experienced in the beginning of joining the project were found to be diminished. The increased cost and logistics of visiting the remote location were noted by the interviewees, but the increased efforts and costs were believed to be justified, as the pros weigh out the cons. The growth of teamness through visiting the offshore location or vice versa,

was proven to be an extremely important enabler of trust and efficient communication, among others.

Table 6. Comparison of impacts caused by geographical distance.

	Geographical distance	
	Pre-existing research	Findings of this study
Communication	Increased cost and logistics of holding face-to-face meetings. Lack of "teamness".	Lack of face-to-face communication. Increased cost and logistics of holding face-to-face meetings. In the beginning communication is challenging with new people. Lack of teamness.
Coordination	Reduced informal contact can lead to lack of task awareness.	Lack of informal contact leads to lack of task awareness. Chance of micromanaging is reduced when distance between teams is increased, the importance of trust is accentuated.
Control	Difficult to convey vision and strategy.	Tracking a task's progress in real-time not feasible if not co-located. Lack of owneship in work tasks due to minimal direct contact with project client.

The lack of informal contact, and the lack of task awareness caused by it was introduced as the greatest inhibitor of efficient coordination in offshore projects with geographically divided teams (Ågerfalk et al., 2005). The data gathered through the interviews shows this to be precise. The interviewees compared the ease of spontaneously asking a colleague the status of their work task when co-located, to using asynchronous communication technologies to find out the status of a work task of an offshore colleague. The difference was experienced to be quite distinct. A positive impact was found in the research, demonstrating that the chance of micromanaging is reduced when teams are distributed geographically.

New impacts related to control in an agile offshore project caused by geographical distance were found in this study. The data shows that the ability to control an offshore project becomes more challenging, as real-time tracking of progress is not feasible when geographically divided. Here the importance of trust is accentuated. In addition, this study demonstrates the impact on control caused by the lack of direct contact between the individuals at the offshore location and the project's client's representatives. The described lack of contact was found to cause a lack of ownership in the work tasks being carried out by the offshore team, which reflects in the quality and schedules of the work tasks.

5.1.3   Impacts of socio-cultural distance

Socio-cultural distance between teams was described by Ågerfalk et al. (2005) to have an impact on communication, by likely causing misunderstandings. As presented in table 7, through this research, this claim was proven to be not only accurate, but its impact on communication was found to be greater than expected. The findings present that even if both parties are fluent in English, the differences in spoken English might come as a shock, especially when starting out in a new project. Understanding the intricacies of the other culture was discovered to be the key to interpreting what is the hidden meaning when something specific is said.

Table 7. Comparison of impacts caused by socio-cultural distance.

	Socio-cultural distance	
	Pre-existing research	Findings of this study
Communication	Risk of misunderstandings.	Language barrier causes problems, especially when starting in a new project misunderstandings are common. Direct communication between project's client and offshore personnel problematic. Communication cultures and differences in hierarchy impacts direct communication.
Coordination	Inconsistency in work practices can impinge on effective coordination, as can reduced cooperation through misunderstandings.	Cultural differences in proactivity and hierarchy have an impact on coordination.
Control	Different perceptions of authority/hierarchy can undermine morale.	Differences in communication cultures and hierarchy in conflict, affecting deadlines, budgets and teamness.

Supplementary findings were discovered, related to the direct communication between the offshore location and the project's client. Even though it would be most efficient for the individuals at the offshore location to be in direct contact with the client's representatives, and vice versa, it was found to be avoided on both sides. A type of cautiousness

was experienced on both sides when collaborating, and usually an onsite employee would act as an intermediary, which is not the most efficient method. In addition, communication was demonstrated to be impinged by cultural differences in communication and hierarchy. The direct and absolute communication culture of Finland was found to be contradictive of the indirect and relative Indian communication culture. In contrast, a better cultural fit of communication was found with the Latvian communication culture, which was described as crudely direct.

In previous research on the topic, socio-cultural distance was presented to negatively impact efficient coordination through inconsistencies in work practices (Ågerfalk et al., 2005). This study presents findings proving this to be precise. Cultural differences in work practices, such as in proactivity and being self-directed, were proven to cause complications in coordinating an offshore project. These discoveries were found to be related to an individual's proactivity in for example starting to work on a new task or updating project management tools autonomously. The findings suggest that these differences between Finnish and Indian working cultures were distinct, and they were proven to cause frustration and to complicate coordination.

The findings of this study support the claims made by Ågerfalk et al. (2005), stating that socio-cultural distance affects an offshore project's control through problems caused by different perceptions of authority and hierarchy. This research demonstrates that differences in authority complicate control. Socio-cultural differences, such as the contrast between the Finnish culture of absolute directness to any level colleague, compared to the Indian culture of not being able to say no to a higher-ranking officer, were discovered to be common. In addition, differences in the perception of deadlines and the ability to be proactive were proven to have an impact on control in the form of issues related to timelines, budget and teamness.

5.2   Limitations of the research

Brink (1993) describes validity and reliability as the main characteristics of everything related to scientific research. He adds that these aspects build the distinction between good and bad research, especially in qualitative work, as the "research findings are often questioned or viewed with scepticism by the scientific community" (p. 35). Validity is defined by Brink (1993, p. 35) as "the accuracy and truthfulness of scientific findings", and that it can be classified into internal and external validity. Brink (1993) expands that internal validity refers to the degree to which the results of the research represent the reality, and external validity refers to the degree to which the findings of the research can be generalized across contexts or groups. Reliability, according to Brink (1993) refers to the repeatability and consistency of the research, meaning the ability of the study and its methods to reliably provide comparable and accurate results repeatedly. The main aspect having an impact on reliability and validity is error, and it can be caused by these four categories of error sources: the researcher, the subjects participating, the situational context, and the methods of data collection and analysis (Brink, 1993).

In qualitative research, Brink (1993) describes the researchers themselves as the main tool for gathering and analysing data, meaning that their capabilities and biases are potentially great sources of error. He expands that the researcher's mere presence might have an influence of the validity of data gathered from subjects, and that characteristics of the researcher, such as trustworthiness and status might also have an impact. For the author of this thesis, a qualitative study of this scale is a first of its kind, so potential impacts to validity and reliability might be caused by inexperience in qualitative research methods.

The second potential sources of error having an impact on validity and reliability, are related to the subjects participating in the research. According to Brink (1993), when collecting data through e.g., interviews or questionnaires, the truthfulness of the participant's answers is a matter of high importance. He explains that the individuals participating the research might for some reason either exaggerate or downplay their answers.

A potential threat to the validity of this research, related to the interviewees of this study was identified. As the case company of this qualitative study is a highly considered actor in its field of business, it could be possible that the interviewees would downplay their answers, as to not damage the reputation of the company. This potential impact was mitigated by guaranteeing anonymity for both company and the interviewees, so that the interviewees would be able to speak freely.

Brink (1993) defines the situation and social context within the data gathering stage as the third potential category of cause of error in qualitative research. He expands that in order to establish reliable and valid study results, "the social context under which the data are gathered is an important consideration" (p. 36). Brink (1993) adds that individual participants behaviour and answers potentially deviate when they are subject to different social contexts and conditions. He exemplifies that individuals might potentially provide differing answers depending on whether they are one-on-one with the researcher, or in a group with other respondents. In addition, Brink (1993) stresses the importance of privacy in data collection, as the interviewee being heard by others might cause hesitation in answering truthfully. Due to the pandemic, all the interviews of this study were held virtually through Microsoft Teams video calls. It is quite difficult to tell if this might have had an impact on the validity or reliability of this study, and if conducting the interviews face-to-face could have provided results of higher quality. But as has been stated earlier in this research, face-to-face discussion has the highest broadband of all communication methods, so conducting the interviews as video calls might have an impact on validity and reliability.

Finally, as the fourth category of potential error in qualitative research is presented by Brink (1993) as the method of data collection and data analysis. He describes that the method of triangulation, meaning the "use of two or more data sources, methods, investigators, theoretical perspectives and approaches to analysis in the study of a single phenomenon" (p. 37) is one of the best tools to increase validity and reliability. Brink (1993) adds that triangulation is used to overcome the insufficiencies often related to

using a solitary method, and to evade the individual biases of the researcher. In this study, the lack of triangulation is most likely the greatest inhibitor of validity and reliability, as only one method of data collection was used.

5.3   Future research topics

As a topic, offshore development and the impacts of distances related to it is a very wide topic, with varying viewpoints to be researched further. The new normal of working remotely, and teams becoming more and more temporally, geographically, and socio-culturally divided makes this field of research highly important, and with lots of questions to be answered. In future research, this study's findings could be verified through more extensive research, considering multiple companies with a wider sample size of interviewees. As a supplement to this research, studies from the offshore point of view would provide interesting results, as this study was only from the onsite point of view. Studies including both viewpoints could provide a more holistic understanding of the effects of distance in offshore development projects. Furthermore, as the method of offshore development has been in use in the field of information for quite some time, it would be interesting to study how time and the development of agile methodologies may have mitigated issues caused by distance between teams.

6 Conclusion

In this research, the utilization of offshore development in agile software development projects has been discussed, with a goal of identifying how the dimensions of distance impact the pillars of a successful offshore relationship. The aim of this study was the answer the following research question:

How do the dimensions of distance impact agile in-house offshore software development projects?

The research was started out through a literature review focusing on the topics of agile software development, including the concept of agility and the most common agile methodologies. The concept of offshore development was discussed, along with categorising the challenges often accompanied with it. The dimensions of distance, namely temporal, geographical, and socio-cultural, and the three pillars of a successful offshore relationship impacted by these distances, communication, coordination, and control were identified through earlier research. Through the literature review a theoretical context was identified, which was used as the framework of the empirical section of this research.

The qualitative research method of interpretive case study was chosen as the method of this study. For the case of this empirical research was chosen a multinational company, which specializes in information technology services. The case company has several in-house offshore software development locations, which can be utilized in software development projects with clients around the globe. No specific project or team was chosen for this study, as the aim was to reach varying levels of experience and job titles with different backgrounds, to ensure diverse findings. The data collection method of this study was semi structured interviews. A total of seven individuals were interviewed before reaching saturation of findings. The data gathered through the interviews was coded and categorized based on the framework identified in the literature review, and then compared to the findings of previous research.

The data collected through the research provides clear evidence, that the three dimensions of distance have a distinct impact in agile in-house offshore development projects. All of the three pillars of a successful offshore relationship were found to be evidently affected by these aforementioned distances. Findings which support earlier research were made, and in addition some new findings were made as well. Temporal distance was found to have a lower impact than was found in previous research. Mostly findings confirming previous studies were revealed, but in addition some discoveries contradicting previous research was made. It was found that it might not be temporal distance causing overlapping hours to be lower, but the differences in working cultures.

Geographical distance had an expected amount of impact on communication, coordination, and control. Several results confirming previous research were made, and in addition some new and interesting discoveries were uncovered. For example, the lack of direct contact between the project's client and offshore personnel was found to cause a certain lack of ownership in work tasks, impacting control. Furthermore, an interesting in a way positive impact was exposed related to the lack of micromanaging, as it is not a phenomenon as probable with geographically divided teams.

The greatest impact on communication, coordination and control out of the three distances was found to be related to socio-cultural distance. This research concluded that the risk of misunderstandings caused by socio-cultural distance is a much greater impact than described in previous research. In addition, new findings related to cultural differences in working cultures and hierarchy were presented.

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Appendices

Appendix 1. Questionnaire

1. Interviewee

   - Background

   - Experience in offshore development projects

   - Which agile methodologies were used?

2. Temporal distance

   - Experiences in temporal distance?

     o How large difference in time?

     o Overlapping hours?

   - Impacts of temporal distance:

     o Communication

     o Coordination

     o Control

   - How were these impacts mitigated?

3. Geographical distance

   - Experiences in geographical distance?

   - Impacts of geographical distance:

     o Communication

     o Coordination

     o Control

   - How were these impacts mitigated?

4. Socio-cultural distance

   - Experiences in socio-cultural distance? (examples: language, organizational and national culture, work ethic)

- Impacts of socio-cultural distance:

    o Communication

    o Coordination

    o Control

- How were these impacts mitigated?